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A STRUCTURAL WEIGHT ESTIMATION PROGRAM (SWEEP) FOR AIRCRAFT. VOLUME XI - FLEXIBLE AIRLOADS STAND-ALONE PROGRAM

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Rockwell International Corporation

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Three computer programs were written with the objective of predicting the structural weight of aircraft through analytical methods. The first program, the structural weight estimation program (SWEEP), is a completely integrated program including routines for airloads, loads spectra, skin temperatures, material properties, flutter stiffness requirements, fatigue life, structural sizing, and for weight estimation of each of the major aircraft structural components. The program produces first-order weight estimates

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered) and indicates trends when parameters are varied. Fighters, bombers, and cargo aircraft can be analyzed by the program. The program operates within 100,000 octal units on the Control Data Corporation 6600 computer. Two stand-alone programs operating within 100,000 octal units were also developed to provide optional data sources for SWEEP. These include (1) the flexible airloads program to assess the effects of flexibility on lifting surface airloads, and (2) the flutter optimization program to optimize the stiffness distribution required for lifting surface flutter prevention.

The final report is composed of 11 volumes. This volume (Volume XI) contains the methodology, program description, and user's information for the flexible loads stand-alone program.

PREFACE

This report was prepared by Rockwell International Corporation, Los Angeles Aircraft Division, Los Angeles, California, under Contract F33615-71-C-1922, No. FX2826-71-01876/C093. The work was performed for the Deputy for Development Planning, Air Force System Command, Wright-Patterson Air Force Base, Ohio, and extended from September 1971 to June 1974.

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The final report was published in 11 volumes; the complete list is as follows:

Volume

I "Executive Summary"
II "Program Integration and Data Management Module"
III "Airloads Estimation Module"
IV "Material Properties, Structure Temperature, Flutter, and Fatigue"
V "Air Induction System and Landing Gear Modules"
VI "Wing and Empennage Module"
VII "Fuselage Module"
VIII "Programmer's Manual"
IX "User's Manual"
X "Flutter Optimization Stand-Alone Program"
XI "Flexible Airloads Stand-Alone Program"

TABLE OF CONTENTS

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LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF SYMBOLS

A	Aspect ratio
A_W	Wing aspect ratio
AF(I)	Load on wing strips, I
AFW(I,J)	Matrix of rigid wingloads on strips, I, for load distributions, J
AFWCP(I,J)	Matrix of wing strip centers of pressure, X/C, on strips, I, for load distributions, J
AFWDF(I,J)	Matrix of incremental flexible wingloads on strips, I, for load distributions, J
AFWF(I,J)	Matrix of flexible wingloads on strips, I, for load distributions, J
A_{NMAX}	Maximum cross-sectional area of body nose, in.^{2}
B	Compressibility factor, $(1-M^2)^{1/2}$
	or
	Cotangent of mach angle, $(M^2-1)^{1/2}$
b	Span of lifting surface, ft
b_{FI}	Spanwise distance from centerline of symmetry to inboard end of wing flap, in.
b_{FO}	Spanwise distance from centerline of symmetry to outboard end of wing flap, in.
BL_{BS}	Butt line station of interface of wing and body, in.
BL	Butt line station, in.
C	Lifting surface chord, in.
C_{AV}	Average lifting surface chord, b/S, in.

C_F	Wing flap chord, in.
C_L	Lifting surface lift coefficient
C_l	Section lift coefficient
$C_{L\alpha WF}$	Flexible wing lift-curve slope, per radian
$C_{L\alpha WO}$	Initial rigid wing lift-curve slope, per radian
$C_{L\alpha WR}$	Rigid wing lift-curve slope, per radian
C_R	Root chord of theoretical wing, in.
C_W	Wing chord, in.
C_Λ	Chord length measure normal to load reference line, in.
CLA	Lift curve slope for wing or horizontal tail, per radian
CYB	Lift curve slope for vertical tail, per radian
DF or δ_F	Wing flap deflection, deg
DMXH	Incremental horizontal tail rolling moment to be applied to vee-type vertical tail only, in.-lb
DXB(W)N	X-distance from wing apex to center of pressure of wing unit carry-over load on body for distribution N, in.
DXH	X-distance from horizontal tail apex to center of pressure of horizontal tail unit airload, including carry-over load, in.

DXW(B)N	X-distance from wing apex to center of pressure of unit airload on exposed wing for distribution N, in.
DXWN	X-distance from wing apex to center of pressure of unit airload on wing, including carry-over load for distribution N, in.
DXW1	X-distance from wing apex to center of pressure of airload on wing, including carry-over load for flexible wing lift due to angle of attack, in.
DXW2	X-distance from wing apex to center of pressure of airload on wing, including carry-over load for rigid wing lift due to wing flap deflection, in.
DXW3	X-distance from wing apex to center of pressure of airload on wing, including carry-over load for incremental flexible wing lift due to wing flap deflection, in.
DXW4	X-distance from wing apex to center of pressure of airload on wing, including carry-over load for flexible wing lift due to vertical acceleration, in.
EI	Wing bending stiffness, $lb\text{-}in.^2$
F(J,1)	Summation of rigid wing unit loads on strips 1 through 10 for distribution J
F(J,2)	Summation of flexible wing unit loads on strips 1 through 10 for distribution J
F(J,3)	Summation of incremental flexible wing unit airloads on strips 1 through 10 for distribution J
F(J,4)	Ratio of flexible load to rigid load, F(J,2) ÷ (F(J,1)
FS	Fuselage station, in.
$FS_{EA=0}$	Fuselage station at intersection of wing elastic with plane of symmetry, in.

GJ	Wing torsional stiffness, lb-in.^{2}
I	Integer used to designate wing strip number
I_y	Airplane pitching moment of inertia, slug ft^2
I_z	Airplane yawing moment of inertia, slug ft^2
J	Integer used to designated wing-loading distribution, i.e., J=1, loading due to angle of attack J=2, loading due to flap deflection J-3, loading due to vertical acceleration
K_{BF}	Flap span normalizing parameter
K_{cF}	Flap lift effectiveness parameter, $(dC_L/d\,\delta_F) \div (dC_L/d\,\alpha)$
K_g	Gust alleviation factor
K_{uz}	Span-loading normalizing parameter
ℓ_N	Body nose length (x-distance from body nose to cross section of maximum area), in.
M	Mach number
m	Cotangent of leading edge sweep angle
M_{x_Λ}	Bending moment along load reference line in swept reference system, in.-lb
M_{y_Λ}	Torsional moment along load reference line about load reference line, in.-lb
$M_{x_{(SOB)}}$	Exposed lifting surface panel rolling moment at body interface station (for wing, horizontal tail, or vertical tail), in.-lb

$M_{y(SOB)}$	Exposed lifting surface panel pitching moment at intersection of load reference line and body interface station (for wing or horizontal tail), in.-lb
$M_{z(SOB)}$	Exposed lifting surface panel yawing moment at intersection of load reference line and body interface station (for vertical tail), in.-lb
N	Integer used to designate type of wing airload distribution, i.e., N=1, flexible lift due to angle of attack N=2, rigid lift due to flap deflection N=3, incremental flexible lift due to flap deflection N=4, flexible lift due to vertical acceleration
N_Y or NY	Airplane side load factor
N_Z or NZ	Airplane vertical acceleration
N_{ZL}	Airplane design limit vertical load factor
N_{ZM}	Airplane maneuver vertical load factor
$\dot{P}$	Airplane pitching acceleration, rad/sec^2
$P_{\Delta FLEX}$	Incremental airload due to flexibility
P_{FLEX}	Flexible airload (rigid load plus incremental load due to flexibility)
P_{RIGID}	Rigid load
P_{WO}	Initial exposed wing panel load
P_{W1}	Initial wing panel load, including carry-over load on body

P_{YVT} or PYV	Vertical tail airload, including carry-over load, lb
P_{YN} or PYN	Side load on body nose, lb
PZH or PZHB	Total vertical load on horizontal tail, including carry-over load on body, lb
P_{ZN} OR PZN	Vertical load on body nose, lb
PZW1 or PZWB1	Total wing airload, including carry-over load on body for flexible lift due to angle of attack, lb
PZW2 or PZWB2	Total rigid wing airload due to wing flap deflection, lb
PZW3 or PZWB3	Total incremental flexible wing airload due to wing flap deflection, lb
PZW4 or PZWB4	Total flexibility wing airload due to vertical acceleration, lb
$\Delta P(11)$	Wing unit carry-over load on body, per side
$\Delta P_{R\alpha}(I)$	Unit airload on wing strip, I, for rigid wing airload due to angle of attack
ΔP_{RF}	Unit airload on wing strip, I, for rigid wing airload due to wing flap deflection
ΔP_{nZ}	Unit inertia load on wing strip, I, normalized to an exposed wing panel weight of -1.0 lb
ΔPZH	Increment horizontal tail airload due to gust or pitching acceleration, lb
ΔPZW1	Increment wing airload due to gust, lb
$\dot{Q}$ or QDOT	Airplane pitching acceleration, rad/sec^2
q	Free-stream dynamic pressure, psf

$\dot{R}$ or RDOT	Airplane yawing acceleration, rad/sec^2
RLOADS	Rigid loads at structural influence coefficient points
R_N	Body nose effective radius, in. $\left(= \sqrt{(A_{NMAX}/2\pi)} \right)$
S_{HT} or S_H	Area of theoretical horizontal tail, ft^2
S_{VT} or S_V	Area of theoretical vertical tail, ft^2
S_W	Area of the theoretical wing, ft^2
SIC($\bar{x}$, $\bar{y}$; $\bar{\xi}$, $\bar{\eta}$)	Structural influence coefficient; i.e., deflection at point $\bar{x},\bar{y}$ due to a 1-pound load at point $\bar{\xi}$, $\bar{\eta}$, in./lb
[SIC]	Matrix of structural influence coefficients
[$\overline{\text{SIC}}$]	Matrix of streamwise slopes
S_{Z_Λ}	Shear along load reference line, lb
$S_{Z_{(SOB)}}$	Exposed lifting surface shear at intersection of load reference line and body interface station, lb
UL(I)	Average running unit normal loading for wing strip I
UL_η	Running unit normal load at η-station along load reference line
UT(I)	Average running unit torsional moment about load reference line for strip I
UT_η	Running unit torsional moment about load reference line at η-station along load reference line

ULN	Same as UL_{η} or UL(I), but is normalized for a 1-pound wing panel load, including body carry-over load for distribution N, lb-in.
UTN	Same as UT_{η} or UT(I), but is normalized for a 1-pound wing panel load, including body carry-over load for distribution N, in.-lb-in.
USZN	Unit normalized shear at stations along load reference line for distribution N, lb
UMXTN	Unit normalized bending moment at stations along load reference line for distribution N, in.-lb
UMYTN	Unit normalized torsional moment about load reference line at stations along load reference line for distribution N, in.-lb
UPZWN	(=1.0) Unit normalized wing panel load, including carry-over load on body for distribution N, lb
UMYWN	Unit normalized wing panel total pitching moment (including carry-over load) at intersection of load reference line and plane of symmetry for distribution N, in.-lb
USZW(B)N	Exposed wing panel unit normalized load for distribution N, lb
UMXW(B)N	Exposed wing panel unit normalized rolling moment at body interface station for distribution N, in.-lb
UMYW(B)N	Exposed wing panel unit normalized pitching moment at intersection of load reference line and body interface station for distribution N, in.-lb
UPZB(W)N	Unit normalized carry-over load on body per side for distribution N, lb
UMYB(W)N	Unit normalized pitching moment about intersection of load reference line and plane of symmetry for body carry-over load per side for distribution N, in.-lb

$USZW2_{SOB}$	Unit normalized exposed wing rigid load due to flap deflection (= USZW(B)N for N=2), lb
V_E	Equivalent airspeed, knots
V_N	Body nose volume (over length, ℓ_N), $in.^3$
W	Airplane gross weight, lb
$W_S(I)$	Weight of wing strip, I, lb
W_{WOP}	Exposed wing panel weight, lb
X	Distance measured along a line paralled to airplane X-axis or fuselage reference line, in.
$\bar{x}$	Chordwise location of wing structure influence coefficient point where deflection is calculated (see Figure 3), in.
(X/C)	Center of pressure location in fraction of chord
$(X/C)_\alpha$	Center of pressure location in fraction of local chord for lift due to angle of attack
$(X/C)_F$	Center of pressure location in fraction of local chord for rigid lift due to wing flap deflection
XBW(B)	Fuselage station of center of pressure of exposed wing airload, in.
XBB(W)	Fuselage station of center of pressure of wing carry-over airload on body, in.
XBH	Fuselage station of center of pressure of horizontal tail airload, including carry-over load, in.
XBV	Fuselage station of center of pressure of vertical tail airload, including carry-over load, in.

ΔX_{Λ}	Distance aft of load reference line measured normal to load reference line (see Figure 3), in.
$(X/C)_{AFT}$	Location of aft influence coefficient points in fraction of chord (see Figure 3)
$(X/C)_{FWD}$	Location of forward influence coefficient points in fraction of chord (see Figure 3)
$(X/C)_{WS}$	Location of center of gravity at wing strip weight in fraction of wing strip mean chord (see Figure 2)
X_{LE}	Fuselage station of loading edge of wing local chord, in.
XCG	Fuselage station of airplane center of gravity, in.
X_N or XBN	Fuselage station of center of pressure of body nose load, in.
X_O	Fuselage station of body nose station, in.
X_{RW} or X_{WE}	Fuselage station of theoretical wing root chord leading edge, in.
X_{RH} or X_{HE}	Fuselage station of theoretical horizontal tail root chord leading edge, in.
X_{RV} or X_{VE}	Fuselage station of theoretical vertical tail root chord leading edge, in.
XW1	Fuselage station of center of pressure of flexible wing airload, including carry-over load, due to angle of attack, in.
XW2	Fuselage station of center of pressure of rigid wing airload, including carry-over load, due to flap deflection, in.
XW3	Fuselage station of center of pressure of incremental flexible wing airload, including carry-over load, due to flap deflection, in.

XW4	Fuselage station of center of pressure of flexible wing airload, including carry-over load, due to vertical acceleration, in.
$\bar{y}$	Spanwise location of wing structural influence coefficient point where deflection is calculated (see Figure 3), measured along elastic axis, in.
Y_{FI}	Spanwise station (butt line) of inboard end of wing flap, in.
Y_{FO}	Spanwise station (butt line) of outboard end of wing flap, in.
Y_{BI}, Y_{BS}, Y_{BW} or Y_{BH}	Spanwise station (butt line) of wing-body or horizontal tail-body interface station, in.
$Y_{W(B)N}$	Spanwise station (butt line) of center of pressure of exposed wing airload due to distribution N, in.
Y_{Λ}	Spanwise station along load reference line measured from intersection of load reference line and plane of symmetry, in.
YBW(B)	Spanwise station (butt line) of center of pressure of exposed wing airload, in.
YBH or YH	Spanwise station (butt line) of center of pressure of horizontal airload, including carry-over load, in.
Z_{BI}	Z-distance from vertical tail theoretical root chord to vertical tail-body interface station, in.
Z_{Λ}	Distance along vertical tail load reference line measure from intersection of load reference line and theoretical vertical tail root chord plane, in.
ZBV	Z-distance from theoretical vertical tail root chord to center of pressure of vertical tail airload, in.

α	Angle of attack, radians
α LOAD	Load due to angle of attack
Γ	Vortex strength, $(C\ C_l)\ V/2$
η	Nondimensional span station, Y(b/2)
$\eta(I)$	Nondimensional span station at center of wing strip, I
$\bar{\eta}$	Distance along wing elastic axis from plane of symmetry to influence coefficient point at which unit load is applied (see Figure 3), in.
Λ_{EA}	Sweep angle of wing elastic axis (see Figure 3), deg
Λ_{LE}	Sweep angle of leading edge, deg
Λ_R	Sweep angle of load reference line, deg
λ	Taper ratio of theoretical lifting surface
$\bar{\lambda}$	Spanwise distance along wing elastic axis measured from plane of symmetry (see Figure 3), in.
μ	Airplane mass ratio, $2(W/S) \div (\rho\, g\, C_{AV}\, C_{L\alpha WF})$
ρ	Air density, slug/ft^3
$\bar{\xi}$	Chordwise location of structural influence coefficient at which unit load is applied (see Figure 3), in.

Section I

INTRODUCTION

During accelerated flight conditions at high speeds, the deflections of the lifting surface structure tend to redistribute the airloads. The resulting airload distribution can be considerably different from that computed on the assumption of complete rigidity. The redistribution results from the change in streamwise angle-of-attack along the span caused by the torsional and bending deflections. For a given mach number, the greater the dynamic pressure, the greater will be the load redistribution.

The airloads module in the SWEEP program does not include the effects of aeroelasticity; i.e., the changes in airload distributions due to structural deflections. A significant refinement is obtained by including the added effects on loads caused by wing structural flexibility. This is accomplished by the use of the stand-alone flexible airloads program described herein. Methods and formulation employed in the stand-alone program are presented in Section II. The computer program description and program usage information are presented in Sections III and IV, respectively.

The stand-alone program requires a substantial amount of external input data. These data consist of (1) airplane geometry data identical to that used by the airloads module (BLCNTL) in the SWEEP program, (2) the wing EI and GJ distribution and elastic axis location, and (3) the specific flight condition case data. The specific flight condition case data include type of flight condition (balanced maneuver, vertical or lateral gust, and pitching or yawing acceleration), mach number and altitude combinations, limit maneuver load factors, pitching and yawing accelerations, airplane weight and CG location, and estimated wing weight distribution. The program calculates the airload and center-of-pressure location for each airplane component and the airload shear, bending moment, and torsion distribution on the wing and empennage surfaces, all for the specified flight condition case.

Section II

METHODS AND FORMULATION

FLEXIBLE AIRLOADS PROGRAM FUNCTIONS

The objective of the flexible airloads stand-alone program, BFCNTL, is to determine the airloads on the airplane components, including the effects of wing flexibility. These loads are determined for a specific flight condition case and are used as an optional external input to the SWEEP program. The methods employed are described in the order that the subroutines USPANF, BNLDSF, and SPABMF are used in the stand-alone program.

Subroutine USPANF is used to determine the lifting surface unit airload shears, moments, centers of pressure, and lift curve slopes, all for a specified mach number and altitude. For the empennage (horizontal and vertical tail) surfaces, the methods described in Volume III, Section II are used. However, for the wing, the methods are revised to include the effects of wing flexibility.

Subroutine BNLDSF is used to determine gross limit airload and center of pressure on each of the airplane components and the airplane inertia factors for specified flight conditions. The methods are revised to include effects of wing flexibility.

Subroutine SPABMF is used to determine limit airload shear, bending moment, and torsion distributions on the lifting surfaces for a specific flight condition. For the empennage surfaces, the methods described in Volume III, Section II, are used. However, for the wing, the methods are revised to include the effects of wing flexibility.

BASIC FLIGHT CONDITIONS

The flexible airload stand-alone program is designed to calculate airplane structural component airloads for a specific flight condition case. The specific flight condition case is defined by the types of condition (maneuver or gust), mach No., altitude, gross weight, cg position, and wing weight distribution. Cases from which a specific case can be selected are shown in Figure 1. It is noted that a specific case may consist of more than one type of condition and at more than one altitude. Cases available are similar to those in the SWEEP program (Volume III, Section II), except that additional altitudes are provided because effects of flexibility vary with dynamic pressure at a given mach number.

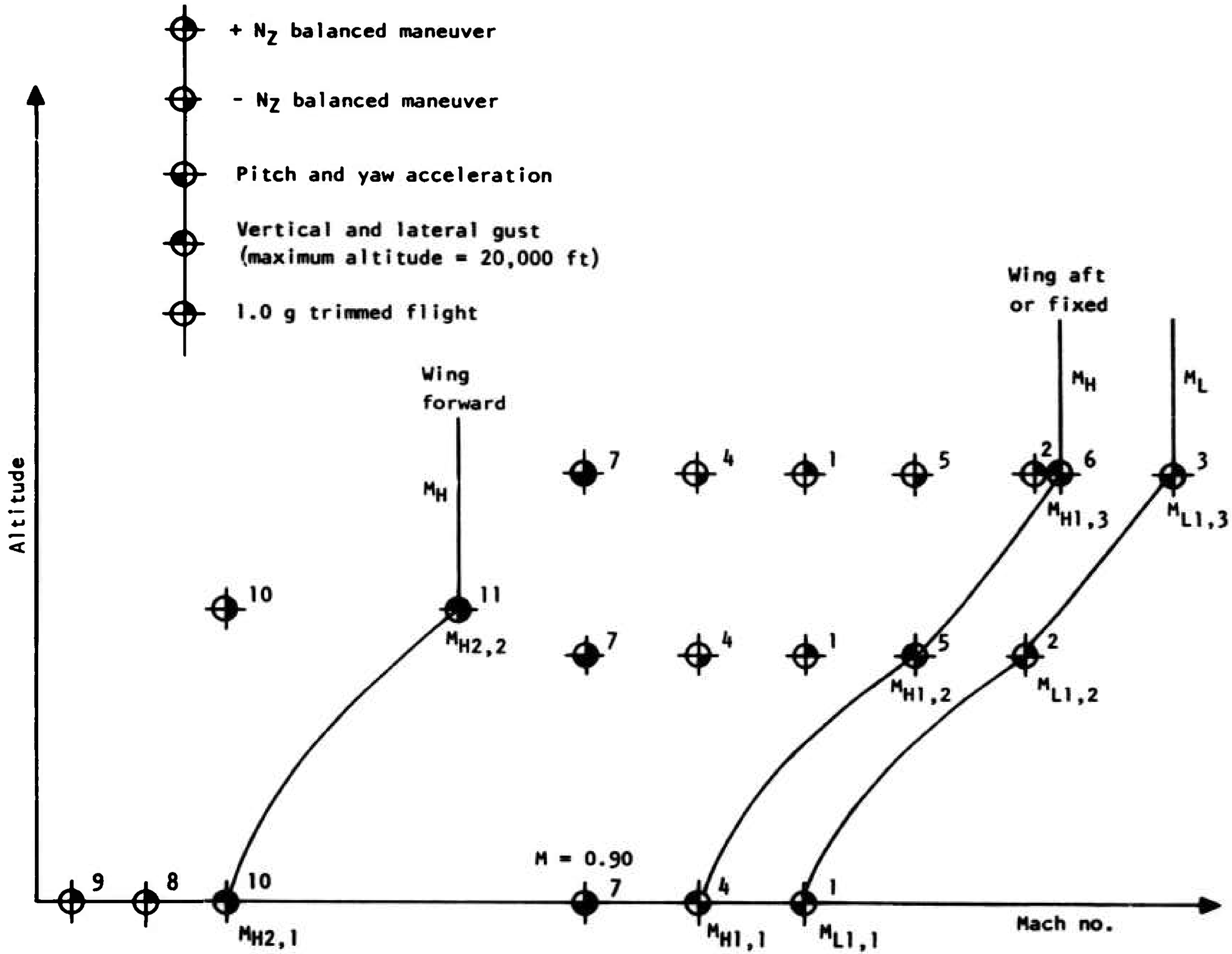


Figure 1. Basic flight condition cases.

Condition case No. 1 through 7 and 10 and 11 cover the basic flight conditions with wing flaps retracted. Condition case No. 8 is a limit load factor maneuver condition with wing flaps down. Condition case No. 9 is a 1.0 g flaps-down trimmed condition for use with landing conditions.

DETERMINATION OF LIFTING SURFACE UNIT AIRLOADS

Methods of analysis used to develop lifting surface unit airload distribution, surface lift curve slopes, and surface airload centers of pressure are presented in this section. Unit airloads are defined, and basic data used for the determination of the surface unit airloads are also presented.

Unit airload shears and moments are determined at 13 selected spanwise stations along the selected load reference line, including root and tip stations. Unit airload shear and moments at the surface-body interface station are determined in the unswept (body axes) system. Overall centers of pressure locations of the exposed panel and body carry-over loads are determined with respect to the theoretical surface apex.

DEFINITION OF UNIT AIRLOADS

The wing unit airload distributions are defined in the following paragraphs.

Unit Rigid Lift Due to Angle of Attack

Unit rigid lift due to angle of attack is the airload distribution due to angle of attack for a rigid lifting surface load of 1 pound per side or panel at a specific mach number.

Unit Flexible Wing Lift Due to Angle of Attack

The unit flexible wing lift due to angle of attack is the net airload distribution due to angle of attack for the flexible wing surface, and is normalized to a wing load of 1.0 pound per side at a specific combination of mach number and dynamic pressure. The net airload distribution includes the combination of the rigid and the aeroelastic increment.

Unit Rigid Lift Due to Wing Flap Deflection

Unit rigid lift due to wing flap deflection is the airload distribution due to flap deflection for a rigid wing surface load of 1 pound per side.

Unit Incremental Flexible Lift Due to Wing Flap Deflection

Unit incremental flexible lift due to wing flap deflection is the incremental flexible airload distribution due to the application of the rigid airload distribution due to wing flap deflection, and is normalized to 1 pound per side at a specific combination of mach number and dynamic pressure.

Unit Rigid Load Due to Vertical Acceleration

Unit rigid load due to vertical acceleration is the wing weight distribution normalized to an exposed wingload of -1 pound per side.

Unit Flexible Wing Lift Due to Vertical Acceleration

Unit flexible wing lift due to vertical acceleration is the incremental flexible airload distribution due to the application of the wing weight distribution, and is normalized to 1 pound per side at a specific combination of mach number and dynamic pressure.

BASIC DATA FOR UNIT AIRLOAD DETERMINATION

The basic data required for unit airloads include all of the lifting surface aerodynamic and geometry data described in Volume III, Section II, and the following wing data:

1. Exposed wing panel weight distribution consisting of weight and CG for each of 10 equally spaced chordwise strips, as shown in Figure 2. CG is in terms of X/C of the strip mean chord.

2. Sweep angle of the wing elastic axis, Λ_{EA}, and the fuselage station of the wing elastic axis at the centerline of symmetry, $FS_{EA} = 0$, are shown in Figure 3.

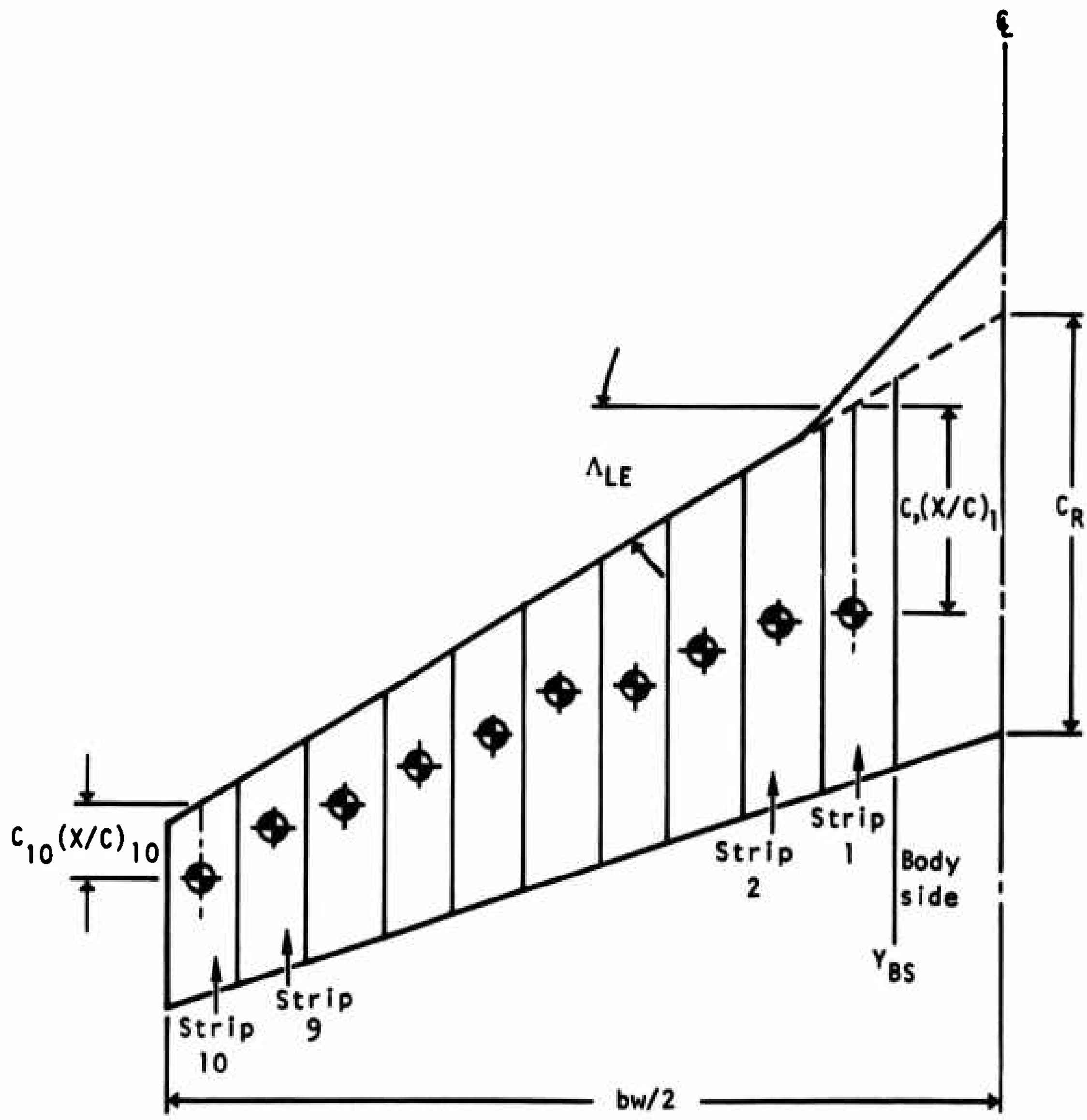


Figure 2. Wing chordwise strips and centers of pressure.

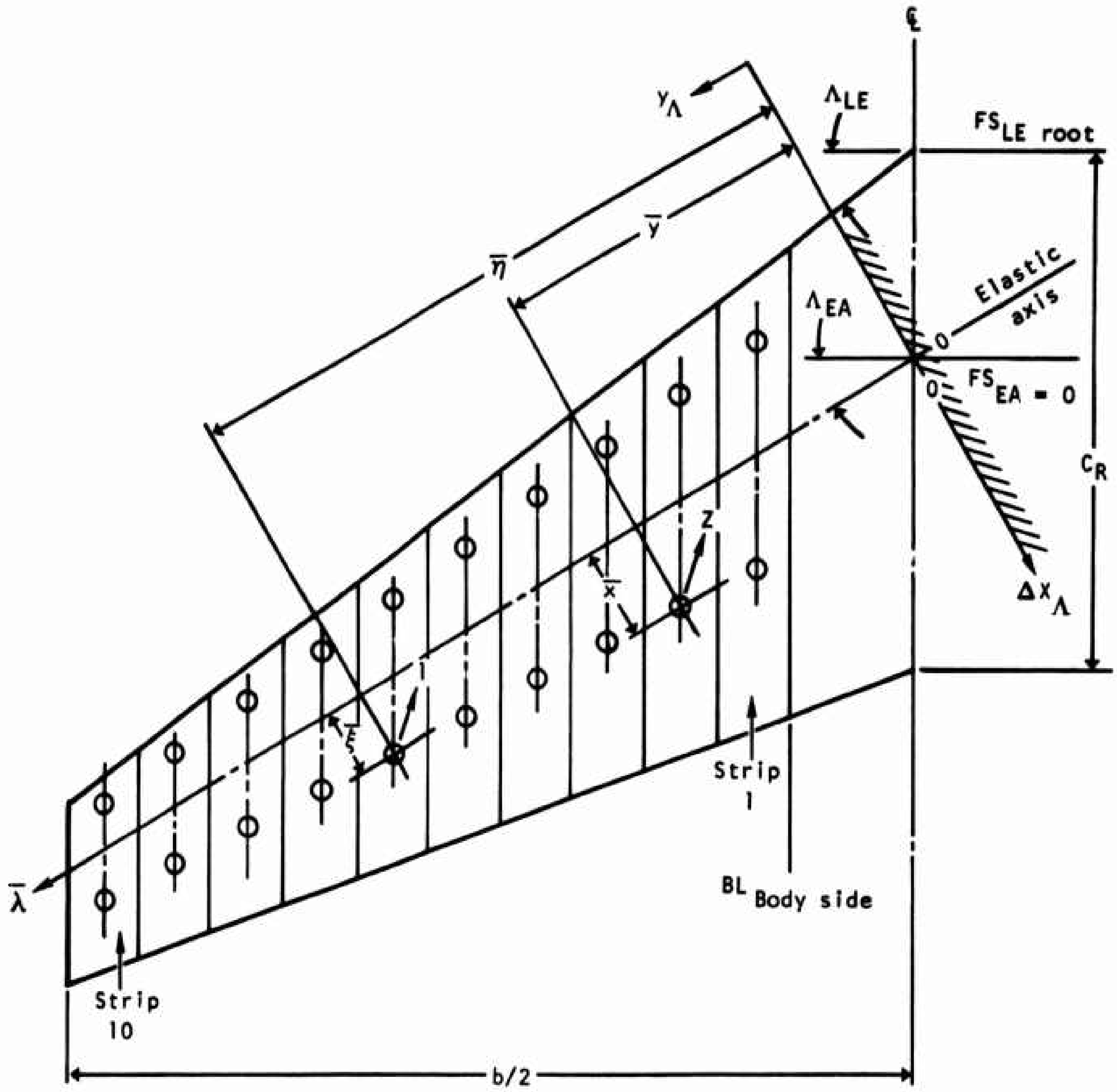


Figure 3. Wing diagram for flexible load analysis.

3. The variation of the exposed wing stiffness parameters, EI and GI, with span station, y_Λ , along the elastic axis.

WING UNIT AIRLOAD DISTRIBUTIONS

The general procedure for the calculation of unit flexible wingload data consists of the following steps:

1. Determination of unit rigid loads and centers of pressure (CP's) on 10 equal-span chordwise strips between the side of the body and wing-tip, and on the strip between the side of the body and airplane centerline of symmetry.

2. Determination of wing rigid lift-curve slope.

3. Determination of unit flexible airloads, unit incremental flexible airloads, and CP's on each strip, and wing flexible-to-rigid load ratios.

4. Determination of wing flexible lift curve slope.

5. Determination of wing unit flexible shear, bending moment, and torsion along the reference line at the span stations specified for weight analysis.

Wing Unit Rigid Airload Due to Angle of Attack

Wing unit rigid loadings, rigid lift curve slope, and CP's are determined as follows.

The wing platform is divided into 10 equal-span chordwise strips between the side of the body station, η_{BS}, and wingtip station, $\eta = 1.0$, and one strip between η_{BS} and the airplane centerline station, $\eta = 0$, as shown in Figure 3.

For subsonic speeds ($M < 1.0$), calculate compressibility factor, B:

$$B = (1 - M^2)^{1/2} \tag{1}$$

and aspect ratio parameter, BA/K:

$$BA/K = A \cdot (B/K) \tag{2}$$

where B/K is obtained by interpolation of B/K versus M data in Figure 4 of Volume III, Section II.

Calculate compressible sweep parameter, Λ_B:

$$\Lambda_B = \text{Arctan}\left\{\frac{1}{B}\left[\tan\Lambda_{LE} - \frac{1}{A}\left(\frac{1-\lambda}{1+\lambda}\right)\right]\right\} \tag{3}$$

Using parameters Λ_B, BA/K, and λ, interpolate $C_\ell C/C_L C_{AV}$ data in Table 1 of Volume III, Section II, to obtain initial $C_\ell C/C_L C_{AV}$ values at the selected η stations, and integrate to obtain initial unit load on each strip; i.e.,

$$\Delta P_o(I) = \int_{\eta(I)\,INBD}^{\eta(I)\,OUTBD}\left(\frac{C_\ell\,C}{C_L\,C_{AV}}\right)d\eta \tag{4}$$

Summate strip loads to obtain initial total wingload, P_{WO}.

$$P_{WO} = \sum_{I=1}^{11} \Delta P_0(I) \tag{5}$$

Arbitrarily change carry-over strip No. 11 load, ΔP_0 (11), to one-half initial value to allow for lift loss due to body interference; i.e.,

$$\Delta P_1\ (11) = \Delta P_o\ (11)/2 \tag{6}$$

Sum strip loads to obtain a new total wing load:

$$P_{W1} = \Delta P_1\ (11) + \sum_{I=1}^{10} \Delta P_o(I) \tag{7}$$

The unit rigid strip loads are then obtained by normalizing a total wing rigid unit load of 1 per side:

For strip 11,

$$\Delta P_{R\alpha}(11) = \left(\frac{1.0}{P_{W1}}\right)\left(\Delta P_1(11)\right) \quad (8)$$

and for strips 1 through 10,

$$\Delta P_{R\alpha}(I) = \left(\frac{1.0}{P_{W1}}\right)\left(\Delta P_o(I)\right) \quad (9)$$

Using parameters Λ_B, BA/K, and λ, interpolate $BC_{L\alpha}/K$ data in Table 2 of Volume III, Section II, to obtain $BC_{L\alpha}/K$ value.

The initial lift curve slope, $C_{L\alpha W0}$, is then,

$$C_{L\alpha W0} = 57.3\ (BC_{L\alpha}/K)/(B/K),\ \text{per radian} \quad (10)$$

and the wing rigid lift curve slope is then,

$$C_{L\alpha WR} = \left(\frac{P_{W1}}{P_{W0}}\right) C_{L\alpha W0},\ \text{per radian} \quad (11)$$

For supersonic speeds ($M > 1.0$), calculate the compressibility factors:

$$B = (M^2 - 1)^{1/2} \quad (12)$$

$$Bm = B\ \text{Cot}\ \Lambda_{LE} \quad (13)$$

$$BA = B \cdot A_W \quad (14)$$

Using BA, Bm, and λ, interpolate $(2\Gamma/V\alpha b)$ in Table 3 of Volume III, Section II, at selected η stations, and integrate to obtain initial load on each strip; i.e.,

$$\Delta P_o(I) = \int_{\eta(I)\ INDB}^{\eta(I)\ OUTBD} (2\Gamma/V\alpha b)\, d\eta \tag{15}$$

Summate strip loads to obtain initial total wingload, P_{W0},

$$P_{W0} = \sum_{I=1}^{11} \Delta P_0(I) \left(= \frac{C_{L\alpha W0}}{A} \right) \tag{16}$$

The initial value of wing lift curve slope is then:

$$C_{L\alpha W0} = A \cdot P_{W0} \tag{17}$$

Arbitrarily change carry-over strip 11 load $\Delta P_0(11)$ to one-half initial value to allow for lift loss due to body interference; i.e.,

$$\Delta P_1(11) = \Delta P_0(11)/2 \tag{18}$$

Sum strip loads to obtain a new total wingload:

$$P_{W1} = \Delta P_1(11) + \sum_{I=1}^{10} \Delta P_0(I) \tag{19}$$

Wing unit rigid strip loads are then obtained by normalizing to give a total wing rigid unit load of 1 per side,

$$\Delta P_{R\alpha}(11) = \left(\frac{1.0}{P_{W1}}\right)\left(\Delta P_1(11)\right) \tag{20}$$

and for strips 1 through 10

$$\Delta P_{R\alpha}(I) = \left(\frac{1.0}{P_{W1}}\right)\left(\Delta P_o(I)\right) \tag{21}$$

Wing rigid lift curve slope is then:

$$C_{L\alpha WR} = \left(\frac{P_{W1}}{P_{W0}}\right) C_{L\alpha W0} \tag{22}$$

The column matrix of unit rigid strip loads due to angle of attack,

$$AFW(I,1) = \Delta P_{R\alpha(I)} \tag{23}$$

where

$$I = 1 \text{ through } 10$$

and $\Delta P_{R\alpha}$ is from equation 9 or 21.

CP's of unit rigid strip loads due to angle of attack are obtained as follows:

- For strips 1 through 10, the CP is at an X/C value based on the mean chord of the strip. The $(X/C)_\alpha$ value is obtained from the $(X/C)_{WING}$ versus mach number plot in Figure 5 of Volume III, Section II.

- For strip 11, the CP is assumed to be at the same fuselage station as the CP of strip 1.

The column matrix of the CP's, AFWCP (I,1), for strip loads due to angle of attack is as follows:

$$AFWCP\ (I,1) = (X/C)_\alpha (I) \tag{24}$$

where

$$I = 1 \text{ through } 10$$

<u>Wing Unit Rigid Airload Due to Wing Flap Deflection</u>

Wing unit rigid strip loadings and CP's are determined as follows.

Calculate wing span ratios for outboard and inboard ends of flap,

$$b_{FO}/b = Y_{FO}/b/2 \tag{25}$$

$$b_{FI}/b = Y_{FI}/b/2 \tag{26}$$

Using parameters b_{FO}/b and b_{FI}/b, interpolate $C_\ell C/C_{L\alpha}C_{AV}$ data in Table 3 of Volume III, Section II, at selected η values for b_{FO}/b and b_{FI}/b flap span ratios.

Calculate initial span loading parameter due to flap deflection at selected η stations,

$$\left(\Delta C_\ell C/C_{L\alpha}C_{AV}\right) = \left(C_\ell C/C_{L\alpha}C_{AV}\right)_{b_{FO/b}} - \left(C_\ell C/C_{L\alpha}C_{AV}\right)_{b_{FI/b}} \tag{27}$$

and integrate to obtain initial load of each of the strips,

$$\Delta P_{FO}\ (I) = \int_{\eta(I)\ INBD}^{\eta(I)\ OUTBD} \left(\Delta C_\ell C/C_{L\alpha}C_{AV}\right) d\eta \tag{28}$$

Summate strip loads to obtain flap span normalizing parameter.

$$K_{BF} = \sum_{I=1}^{11} \Delta P_{FO}\ (I) \tag{29}$$

Unit rigid strip loads due to flap deflection are then,

$$\Delta P_{RF}(I) = \frac{1}{K_{BF}} \cdot \Delta P_{FO}(I) \tag{30}$$

The column matrix of unit rigid strip loads for the lift due to flap deflection, AFW (I,2), is as follows:

$$AFW(I,2) = \Delta P_{RF}(I) \tag{31}$$

where

$$I = 1 \text{ through } 10$$

CP's of unit rigid strip loads due to flap deflection are obtained as follows:

- For strips 1 through 10, the CP is at an X/C value based on the mean chord of the strip. The $(X/C)_F$ value is obtained from the $(X/C)_F$ versus (C_f/C_w) data in Figure 6 of Volume III, Section II.

- For strip 11, the CP is assumed to be at the same fuselage station as for strip 1.

The column matrix of CP's for unit rigid strip loads due to flap deflection, AFWCP (I,2), is then:

$$\text{AFWCP}\ (I,2) = (X/C)_F\ (I) \tag{32}$$

where

$$I = 1 \text{ through } 10$$

Wing Unit Rigid Load Due to Vertical Acceleration

Unit rigid strip loads due to vertical acceleration consist of the weight of the strip normalized to an exposed wing load of -1 pound per side; i.e.,

$$\Delta P_{nz}(I) = -\frac{1}{W_{WOP}} \cdot W_S\ (I) \tag{33}$$

where

$$W_S(I) = \text{strip weight}$$

and

$$W_{WOP} = \sum_{I=1}^{10} W_S\ (I) \tag{34}$$

The column matrix of the rigid strip loads due vertical acceleration, AFW (I,3) is then:

$$AFW\ (I,3) = \Delta P_{nz}\ (I) \tag{35}$$

where

$$I = 1 \text{ through } 10$$

CP's of rigid strip loads, $(X/C)_{W_S}$, are based on the mean chord of the strip, as shown in Figure 2. The column matrix of the CP's, AFWCP (I,3), is then:

$$AFWCP\ (I,3) = (X/C)_{W_S}\ (I) \tag{36}$$

where

$$I = 1 \text{ through } 10$$

Wing Flexible Airload Distributions

The methods used to calculate the redistributed wing airloads caused by the wing torsional and bending deflections are based on strip theory. Redistributed wing loads include the effects of the wing deflections resulting from (1) lift due to angle of attack, (2) lift due to flap deflection, and (3) inertia load due to vertical acceleration.

Wing Structural Influence Coefficients

For the static aeroelastic analysis, the exposed semispan of the wing is divided into 10 evenly spaced strips, as shown in Figure 3. Two structural influence coefficient points are placed on the centerline of each strip, one at X/C forward and one at X/C aft. The values of fuselage stations (FS) and the butt line (BL) for the points on strip I are formed as follows:

$$BL = BL_{BS} + (2I-1)\left(\frac{b/2 - BL_{BS}}{20}\right) \tag{37}$$

$$X_{LE} = FS_{LE\ ROOT} + BL \cdot \tan\Lambda_{LE} \tag{38}$$

$$C = C_{ROOT}\left[1 - \frac{BL}{b/2}(1 - \lambda)\right] \tag{39}$$

$$FS_{FWD} = \left[(X/C)_{FWD} \cdot C\right] + X_{LE} \tag{40}$$

$$FS_{AFT} = \left[(X/C)_{AFT} \cdot C\right] + X_{LE} \tag{41}$$

where

$$(X/C)_{FWD} = 0.15$$

and

$$(X/C)_{AFT} = 0.65.$$

The coordinates are then converted into the swept elastic axis system (Figure 3).

$$\bar{x} = (FS - FS_{EA=0})\cos\Lambda_{EA} - BL \cdot \sin\Lambda_{EA} \tag{42}$$

$$\bar{y} = (FS - FS_{EA=0})\sin\Lambda_{EA} + BL \cdot \cos\Lambda_{EA} \tag{43}$$

NOTE The elastic axis does not have to be a constant-percent chord line.

Elements of the SIC matrix are formed using the following equation:

$\bar{\eta} \geq \bar{y}$

$$\mathrm{SIC}\ (\bar{x}, \bar{y}; \bar{\xi}, \bar{\eta}) = \int_0^{\bar{y}} \frac{(\bar{\eta} - \bar{\lambda})\ (\bar{y} - \bar{\lambda})}{EI}\, d\bar{\lambda}\ +$$

$$\bar{x}\ \bar{\xi} \int_0^{\bar{y}} \frac{1}{GJ}\, d\,\bar{\lambda} \tag{44}$$

Each element of the SIC matrix represents the deflection at $\bar{x}$, $\bar{y}$ due to a 1-pound vertical load at $\bar{\xi}$, $\bar{\eta}$. The preceding equation is integrated to form the upper right triangle of the SIC matrix. In this process of integration, the value of $\bar{y}$ sometimes exceeds $\bar{\eta}$. In that case, the upper limit of integration is changed to $\bar{\eta}$. The other half of the SIC matrix is formed by symmetry.

$$SIC_{ij} = SIC_{ji} \tag{45}$$

For the static aeroelastic analysis, a matrix of streamwise slopes, $\overline{SIC}$, is required. This matrix is formed by premultiplying the SIC matrix by a differential operator matrix called D_θ, which is formed from the structural influence point geometry. The elements of D_θ are formed as follows, where I goes from 1 through 10.

$$D_\theta\ (I,2I-1) = \frac{1}{FS_{AFT}(I)\ -\ FS_{FWD}(I)} \tag{46}$$

$$D_\theta\ (I,2I) = \frac{-1}{FS_{AFT}(I)\ -\ FS_{FWD}(I)} \tag{47}$$

The $\overline{SIC}$ matrix is then formed as:

$$\left[\overline{SIC}\right]_{10,20} = \left[D_\theta\right]_{10,20} \left[SIC\right]_{20,20} \tag{48}$$

Wing Aerolastic Distributions

<u>General Method</u>. For each load effect, the total flexible wing load distribution is:

$$\left\{ P_{FLEX} \right\} = \left\{ P_{RIGID} \right\} + \left\{ P_{\Delta FLEX} \right\} \tag{49}$$

Where the incremental aeroelastic load distribution is related to the flexible load:

$$\left\{ P_{\Delta FLEX} \right\} = q \left[A \right] \left[\overline{SIC} \right] \left\{ P_{FLEX} \right\} \tag{50}$$

In this simplified solution, the aerodynamic load matrix, A, is defined as a diagonal matrix formed from the α distribution load on each chordwise strip.

$$[A] = [\alpha \text{ LOAD}] \tag{51}$$

The equation for the aeroelastic solution is then formed as:

$$\left\{ P_{FLEX} \right\} = \left\{ P_{RIGID} \right\} + q \left[\alpha \text{LOAD} \right] \left[\overline{SIC} \right] \left\{ P_{FLEX} \right\} \tag{52}$$

Transpose and factor out P_{FLEX}:

$$\left[\left[\diagdown I \diagdown \right] - q \left[\alpha \text{LOAD} \right] \left[\overline{SIC} \right] \right] \left\{ P_{FLEX} \right\} = \left\{ P_{RIGID} \right\} \tag{53}$$

Let

$$\begin{bmatrix} D \end{bmatrix} = \begin{bmatrix} \diagdown I \diagdown \end{bmatrix} - q \begin{bmatrix} \alpha LOAD \end{bmatrix} \begin{bmatrix} \overline{SIC} \end{bmatrix} \tag{54}$$

then,

$$\begin{bmatrix} D \end{bmatrix} \begin{Bmatrix} P_{FLEX} \end{Bmatrix} = \begin{Bmatrix} P_{RIGID} \end{Bmatrix} \tag{55}$$

Formulation for Flexible Airloads Program. The rigid loads distribution, AFW, for α, δ FLAP, and WEIGHT, are distributed to the SIC points by simply beaming the load on each strip, using the corresponding chordwise centers of pressure, AFWCP.

$$RLOADS(2I-1,J) = AFW(I,J) \frac{AFWCP(I,J) - (X/C)_{AFT}}{(X/C)_{FWD} - (X/C)_{AFT}} \tag{56}$$

$$RLOADS(2I,\ J) = AFW(I,J) \frac{-AFWCP(I,J) + (X/C)_{FWD}}{(X/C)_{FWD} - (X/C)_{AFT}} \tag{57}$$

where

I = 1 through 10

and

J = 1 α load

J = 2 δF load

J = 3 weight

Define C as:

$$C = C_{L_\alpha} q \frac{S_W}{2} \tag{58}$$

The D-matrix is then formed a column at a time, using column 1 of the RLOADS matrix; i.e., the α load distribution and the $\overline{SIC}$ matrix. The column K goes 1 through 20.

$$D(2I-1,K) = -C \cdot RLOADS(2I-1,1) \cdot SICBAR(I,K) \tag{59}$$

$$D(2I,K) = -C \cdot RLOADS(2I,1) \cdot SICBAR(I,K) \tag{60}$$

where

$$I = 1 \text{ through } 10$$

The D-matrix is completed by adding 1.0 to each diagonal element.

$$D(K,K) = 1.0 + D(K,K)$$

The static aeroelastic equation to be solved is then:

$$\begin{bmatrix} D \end{bmatrix}_{20,20} \begin{bmatrix} \text{(FLEXIBLE)} \\ \text{FLOADS} \end{bmatrix}_{20,3} = \begin{bmatrix} \text{(RIGID)} \\ \text{RLOADS} \end{bmatrix}_{20,3} \tag{61}$$

This equation is solved for the flexible loads a column at a time, using a general least-squares technique. This technique is used because it is very fast and will work with even a poorly conditioned matrix. This method gives the solution to a system of linear equations $Bx = C$, where B is an $N \times M$ matrix with $N \geq M$, and C is a column vector of dimension N. In the over-determined case, a least-squares solution is obtained.

The method finds an $N \times N$ matrix R such that R is orthogonal (i.e., $R^T R = I$) and

$$R(B,C) = \begin{pmatrix} T & d \\ 0 & \alpha \\ 0 & 0 \end{pmatrix}$$

where T is an $M \times M$ triangular matrix and d is an M-dimensional column vector. The number α is the square root of the sum of the squares of the residuals. Solution of the problem is then the solution of $Tx=d$, and is found by back substitution.

Once flexible loads at the SIC points have been determined, flexible loads on the strips, AFWF, are formed by a simple summation; the delta flexible loads, AFWDF, are formed by subtracting rigid loads from flexible loads.

$$AFWF(I,J) = FLOADS(2I-1,J) + FLOADS(2I,J) \tag{62}$$

$$AFWDF(I,J) = AFWF(I,J) - AFW(I,J) \tag{63}$$

where

$$I = 1 \text{ through } 10$$

The total summed rigid loads, flexible loads, delta flexible loads, and flexible-to-rigid load ratios are:

$$\text{Rigid} \qquad F(J,1) = \sum_{I=1}^{10} AFW(I,J) \tag{64}$$

$$\text{Flexible} \qquad F(J,2) = \sum_{I=1}^{10} AFWF(I,J) \tag{65}$$

$$\Delta\text{Flexible} \qquad F(J,3) = F(J,2) - F(J,1) \tag{66}$$

$$\frac{F}{R} \qquad F(J,4) = \frac{F(J,2)}{F(J,1)} \tag{67}$$

Because the rigid load distribution on the strips is used for delta flexible loads, the chordwise CP on each load strip is the same for the delta flexible loads as it is for the rigid α load.

The wing flexible lift curve slope is determined as follows:

$$C_{L\,\alpha WF} = C_{L\,\alpha WR} \left[\frac{\Delta P_{\alpha}\ (11) + \sum_{I=1}^{10} AFWF\ (I,1)}{\Delta P_{\alpha}\ (11) + \sum_{I=1}^{10} AFW\ (I,1)} \right] \qquad (68)$$

where ΔP_{α} (11) is from equation 8 or 20, AFWF (I,1) is the column matrix of flexible strip loads due to angle of attack, and AFW(I,1) is the column matrix of rigid strip loads due to angle of attack from equation 23.

Wing Unit Shears and Moments

Wing unit airload shears and moments for the flexible wing are developed using the column matrices of strip loads and CP's. The average unit running normal loading on a strip is the strip load (AF(I) divided by the strip width, and the running torsional moment is the running normal loading times the normal distance from strip CP to the selected load reference line for weight analysis. The average running normal loading and running torsional moment are applied at η station for the midspan at the strip.

Running loadings on the exposed wing along the load reference line are as follows (where η (I) is the η station at the midspan of the strip I, UL(I) is the unit running normal loading at station η (I), and UT(I) is the unit running torsional moment at station η (I)):

$$\eta(I) = \eta_{BS} + 0.05\ (1 - \eta_{BS}) + 0.1\ (I - 1)\ (1 - \eta_{BS})$$

$$= -0.05 + 1.05_{\ BS} + (1 - \eta_{BS})\ I/10 \qquad (69)$$

$$UL(I) = \frac{AF\ (I)}{0.1\ (1 - \eta_{BS})} \qquad (70)$$

$$UT(I) = -\Delta X_{\Lambda}\ (I) \cdot UL(I) \qquad (71)$$

The term $\Delta X_\Lambda(I)$ is the normal distance from the load reference line to the local CP and is determined, using the methods of Volume III, Section II, as follows:

$$\Delta X_\Lambda(I) = C_\Lambda(I)\left[(X_\Lambda/C_\Lambda)_{CP} - (X_\Lambda/C_\Lambda)_R\right] \tag{72}$$

where

$$C_\Lambda(I) = \frac{[1 + \eta(I)\ (1 - \lambda)]\ C_R \cos\Lambda_R}{1 - K_\Lambda\left[1 - (X/C)_R - (X_\Lambda/C_\Lambda)_R\right]} \tag{73}$$

$$K_\Lambda = \frac{4}{A}\left(\frac{1 - \lambda}{1 + \lambda}\right)\left(\sin\Lambda_R \cos\Lambda_R\right) \tag{74}$$

$$(X_\Lambda/C_\Lambda)_R = (X/C)_R\left[1 - K_\Lambda\left(1 - (X/C)_R\right)\right] \tag{75}$$

$$(X_\Lambda/C_\Lambda)_{CP} = (X/C)_{CP}\left[1 - K_\Lambda\left(1 - (X/C)_{CP}\right)\right] \tag{76}$$

Running unit normal loading inboard of the side of the body ($\eta < \eta_{BS}$) is assumed to be constant and is:

$$UL_\eta = \frac{\Delta P\ (11)}{\eta_{BS}} \tag{77}$$

where $\Delta P(11)$ is the unit airload on strip 11.

Unit running torsional moment inboard of the body side about the load reference line at station η is:

$$UT_\eta = -\Delta X_{\Lambda\eta} \cdot UL_\eta \tag{78}$$

where $\Delta X_{\Lambda\eta}$ is determined, as follows.

The CP is assumed to be at a constant fuselage station equal to the fuselage station of the CP at strip 1. Then, when $\eta < \eta_{BS}$,

$$\Delta X_{\Lambda \eta} = \Delta X_{\Lambda \eta_{(I = 1)}} + \left(\eta_{(I = 1)} - \eta\right) \left(\frac{b}{2}\right)\left(\sin \Lambda_R\right) \qquad (79)$$

where $\eta_{(I = 1)}$ is from equation 69

and $\Delta X_{\Lambda \eta_{(I = 1)}}$ is from equation 72

Unit running normal and torsional loadings for the specific type of distributions are obtained using the following strip load data:

1. For flexible lift due to angle-of-attack distribution, use the following:

   a. In equation (70): AF(I) = AFWF(I,1) from equation 62

   b. In equation (76): $(X/C)_{CP}$ = AFWCP(I,1) from equation 24

   c. In equation (77): $\Delta P(11) = \Delta P_{\alpha R}(11)$ from equation 8 or 20, depending on mach number

2. For rigid lift due to flap deflection distribution, use the following:

   a. In equation (70): AF(I) = AFW(I,2) from equation 31

   b. In equation (76): $(X/C)_{CP}$ = AFWCP(I,2) from equation 32

   c. In equation (77): $\Delta P(11) = \Delta P_{FR}(11)$ from equation 30

3. For incremental flexible lift due to flap deflection distribution, use the following:

   a. In equation (70): AF(I) = AFWDF(I,2) from equation 63

   b. In equation (76): $(X/C)_{CP}$ = AFWCP(I,1) from equation 24

   c. In equation (77): $\Delta P(11) = 0$

4. For incremental flexible lift due to vertical acceleration distribution, use the following:

   a. In equation (70): AF(I) = AFWDF(I,3) from equation 63

   b. In equation (76): $(X/C)_{CP}$ = AFWCP(I,1) from equation 24

   c. In equation (77): ΔP(11) = 0

Wing unit shear and moments are calculated along the selected load reference line at the η stations selected for weight analysis and are normalized for a surface load of 1 pound per side.

Unit span normal loading, UL, from equations 70 and 77, is integrated to obtain the unit shear values, USZN, at the selected η stations; i.e.,

$$\mathrm{USZN} = K_{UZ} \int_{\eta}^{1.0} (\mathrm{ULN})d\,\eta \tag{80}$$

where

$$K_{UZ} = \left[\frac{1.0}{\int_{0}^{1.0} (\mathrm{ULN})d\,\eta}\right] \tag{81}$$

Unit shear, USZ, is integrated to obtain the unit bending moment,

UMXTN:

$$\mathrm{UMXTN} = \frac{b}{2\cos\Lambda_R}\left[\int_{\eta}^{1.0} (\mathrm{USZN})d\,\eta\right] \tag{82}$$

Unit running torsional moment, UT, from equations 71 and 78, is integrated to obtain the unit torsional moment, UMYTN:

$$UMYTN = K_{UZ} \int_{\eta}^{1.0} (UTN) d_{\eta} \qquad (83)$$

In equations 80 through 83, the N in ULN, USZN, UMXTN, UMYTN, and UTN is used to designate the type of distribution; i.e.,

N = 1 for flexible lift due to angle of attack

N = 2 for rigid lift due to flap deflection

N = 3 for incremental flexible lift due to flap deflection

N = 4 for flexible lift due to vertical acceleration

Wing unit airloads and CP's for each of the four types of airload distribution are determined as follows.

Total wing unit airload per side, UPZWN; wing unit pitching moment per side, UMYWN, at the intersection of the wingload reference line and the A/P centerline; and CP of the wing unit airload, DXWN, measured aft from the theoretical wing apex, are as follows:

$$UPZWN = (USZN)_{\eta = 0} = 1.0 \qquad (84)$$

$$UMYWN = (UMYTN)_{\eta = 0} \cos \Lambda_R - (UMXTN)_{\eta = 0} \sin \Lambda_R \qquad (85)$$

$$DXWN = C_R (X/C)_R - (UMYWN)/(UPZWN) \qquad (86)$$

Exposed wing unit loads of the intersection of the wingload reference line and the body side in the body reference system are as follows:

$$USZW(B)N = (USZN)_{\eta_{BS}} \qquad (87)$$

$$UMXW(B)N = (UMXTN)_{\eta_{BS}} \cos \Lambda_R + (UMYTN)_{\eta_{BS}} \sin \Lambda_R \qquad (88)$$

$$UMYW(B)N = (UMYTN)_{\eta_{BS}} \cos \Lambda_R - (UMXTN)_{\eta_{BS}} \sin \Lambda_R \qquad (89)$$

NOTE Also

$$USZW(B)N = \left[\frac{(USZN)_{\eta_{BS}}}{(USZN)_{\eta=0}}\right] UPZWN \tag{90}$$

$$DXW(B)N = C_R(X/C)_R + Y_{BS}\tan\Lambda_R - \frac{UMYW(B)N}{USZW(B)N} \tag{91}$$

$$YW(B)N = Y_{BS} + \frac{UMXW(B)N}{USZW(B)N} \tag{92}$$

Wing unit carry-over load on the body, UPZB(W)N, and its CP, DXB(W)N, are determined as follows:

$$UPZB(W)N = (USZN)_{\eta=0} - (USZN)_{\eta_{BS}} \tag{93}$$

$$UMYB(W)N = \left[UMYTN_{\eta=0} - UMYTN_{\eta_{BS}}\right]\cos\Lambda_R -$$

$$\left[UMXTN_{\eta=0} - UMXTN_{\eta_{BS}} - (USZN_{\eta_{BS}})\left(\frac{Y_{BS}}{\cos\Lambda_R}\right)\right]\sin\Lambda_R \tag{94}$$

$$DXB(W)N = C_R(X/C)_R - \frac{UMYB(W)N}{UPZB(W)N} \tag{95}$$

EMPENNAGE UNIT AIRLOAD DISTRIBUTIONS

The unit airload distributions on the horizontal and vertical tail surfaces are determined using the methods described in Volume III, Section II.

COMPONENT LIMIT AIRLOADS

Gross limit airloads on airplane components and airplane inertia factors are determined for specific types of flight conditions, using methods similar to those described in Volume III, Section II. Revisions are made to include the effects of wing flexibility, consisting of the following:

1. Wing airload is divided into four parts: (1) flexible load due to angle of attack, (2) rigid load due to flap deflection, (3) incremental flexible load due to flap deflection, and (4) incremental flexible load due to vertical acceleration.

2. Airplane balance equations are expanded to incorporate added wingload parts.

3. Flexible wing lift curve slope is used to determine wing incremental gust load.

BALANCED MANEUVER CONDITION

The balanced maneuver condition is a flight condition where the aircraft is trimmed (balanced) by a horizontal tail or canard load. Incremental loads due to flap deflection are determined only for low subsonic conditions.

Wing airloads consist of the following:

PZW1 = Flexible lift due to angle of attack

PZW2 = Rigid lift due to flap deflection

PZW3 = Incremental flexible lift due to flap deflection

PZW4 = Flexible lift due to vertical acceleration

Their corresponding CP's in terms of fuselage station, are:

$$XW1 = X_{RW} + DXW1 \tag{96}$$

$$XW2 = X_{RW} + DXW2 \tag{97}$$

$$XW3 = x_{RW} + DXW3 \tag{98}$$

$$XW4 = X_{RW} + DXW4 \tag{99}$$

DXWN values are obtained from equation (86) for each type of distribution.

For a given mach No., dynamic pressure, load factor and flap deflection, wingloads are determined as follows:

PZW1 is obtained from the balance equation (110)

$$PZW2 = \frac{\delta f}{57.3} K_{CF} K_{BF} C_{L\alpha WR} qS_W \tag{100}$$

Where

δ_f = flap deflection in degrees

$$K_{CF} = \frac{dC_L/d\delta_f}{dC_L/d\alpha}$$

and is obtained by interpolation of the

K_{CF} versus (C_F/C_W) data in Figure 6 of Volume III, Section II

K_{BF} is obtained from equation 29

$C_{L\alpha WR}$ is obtained from equation 11

q = dynamic pressure, psf

S_W = theoretical wing area

$$PZW3 - (PZW2)\ (USZW2)_{S\emptyset B} \left[\frac{F}{R} - 1.0\right] \tag{101}$$

Where $(USZW2)_{S\emptyset B}$ is the unit rigid wingload at the body side due to flap deflection and is obtained from equation 87.

F/R = matrix element F(2,4) from equation 67

$$PZW4 = 2.0\ (N_Z)\ (W_{W\emptyset P}) \left[\frac{F}{R} - 1.0\right] \tag{102}$$

Where N_Z is the specified load factor and

$W_{W\emptyset P}$ = exposed wing weight per side

$\frac{F}{R}$ = matrix element F(3,4) from equation 67

Body nose load, P_{ZN}, is as defined as follows:

$$P_{ZN} = \alpha \, 2 \, \pi \, R_N^{\,2} \, q/144$$

$$= 0.043633 \, \alpha \, R_N^{\,2} q \tag{103}$$

Where R_N is the maximum nose radius (inches), α is the angle of attack and

$$\alpha = \frac{PZW1/qS_W}{C_{L\alpha WF}} \tag{104}$$

Where $C_{L_{\alpha}WF}$ is the flexible wing lift curve slope and is obtained from equation 68.

Substituting equation 104 in 103:

$$P_{ZN} = \frac{0.043633(PZW1)\ R_N^{\,2}}{S_W \ C_{L\alpha WF}} \tag{105}$$

CP of the body nose load is:

$$XN = X_o + \left(\ell N - \frac{V_N}{\pi R_N^{\,2}} \right) \tag{106}$$

Horizontal tail load is P_{ZH} and is obtained from the balance equation 111. CP of the horizontal tail is:

$$XH = X_{RH} + DXH \tag{107}$$

Where X_{RH} is the fuselage station of the leading edge of the horizontal tail theoretical root chord, DXH is the X-distance aft of the root chord leading edge to the CP and is obtained from equation 50 in Volume III, Section II.

Airplane balance equations, where $\dot{Q} = 0$, are as follows:

$$\Sigma My = 0$$

$$(PZW1)\left[(XCG - XW1) + (XCG - XN)\left(\frac{0.043633\ R_N^{\ 2}}{S_W\ C_{L\alpha WF}}\right)\right] +$$

$$PZW2\ (XCG - XW2) + PZW3\ (XCG - XW3) +$$

$$PZW4\ (XCG - XW4) + PZH\ (XCG - XH) = 0 \tag{108}$$

$$\Sigma P_Z = 0$$

$$PZW1\left(1 + \frac{0.043633\ R_N^{\ 2}}{S_W\ C_{L\alpha WF}}\right) + PZW2 + PZW3 +$$

$$PZW4 + PZH - N_Z W = 0 \tag{109}$$

Solving equations 108 and 109 for PZW1 and PZH,

$$PZW1 = \frac{(N_Z W)F - (PZW2)(C\text{-}F) - (PZW3)(D\text{-}F) - (PZW4)\ (E\text{-}F)}{B - AF} \tag{110}$$

$$PZH = N_Z W - A(PZW1) - PZW2 - PZW3 - PZW4 \tag{111}$$

where

$$A = 1 + \frac{0.043633\ R_N^{\ 2}}{S_W\ C_{L\alpha WF}} \tag{112}$$

$$B = (XCG - XW1) + (XCG - XN)\left(\frac{0.043633\ R_N^{\ 2}}{S_W\ C_{L\alpha WF}}\right) \tag{113}$$

$$C = (XCG - XW2) \tag{114}$$

$$D = (XCG - XW3) \tag{115}$$

$$E = (XCG - XW4) \tag{116}$$

$$F = (XCG - XH) \tag{117}$$

$$PZN = (A-1)\ PZW1 \tag{118}$$

PITCHING ACCELERATION CONDITION

The pitching acceleration condition is an arbitrary condition where a specified value of pitching acceleration is caused by an incremental horizontal tailload and is superimposed on a balanced maneuver condition such that the resulting load factor is one-half the design limit positive maneuver load factor.

The incremental horizontal tailload required to produce the specified pitching acceleration, $\dot{Q}$, is:

$$\Delta PZH = -12 \frac{\dot{Q}\ I_y}{XH - XCG} \tag{119}$$

Where, I_y = airplane pitching moment of inertia, slug ft^2, and XH is obtained from equation 107.

The maneuver load factor, N_{ZM}, is determined as follows:

$$N_{ZM} = \frac{N_{ZL}}{2} - \frac{\Delta PZH}{W} \tag{120}$$

Where N_{ZL} is the design limit maneuver load factor

W = airplane weight

Equations 96 through 118, with the following exceptions, are then used to determine the component loads:

$$PZW4 = -2.0 \left(\frac{N_{ZL}}{2}\right) (W_{WØP}) \left[\frac{F}{R} - 1.0\right] \tag{121}$$

$$PZW1 = \frac{N_{ZM} F - (PZW4)(E-F)}{B - AF} \tag{122}$$

$$PZH = N_{ZM} W - A(PZW1) - PZW4 + \Delta PZH \tag{123}$$

VERTICAL GUST CONDITION

The vertical gust condition consists of a ±50 fps vertical gust encounter superimposed on a 1.0g trimmed condition.

Equivalent airspeed (V_E), airplane mass ratio (μ), and the gust alleviation factor (Kg) are determined using equations 115 through 119 of Volume III, Section II, at the specified mach number and altitude.

Component loads $PZW1_{N_Z = 1.0}$ and $PZH_{N_Z = 1.0}$, for the 1.0g trimmed condition are determined using equations (110) and (111), where $N_Z = 1.0$ and $\delta_f = 0$.

Airplane normal load factor, N_Z, is determined as follows:

$$N_Z W = A \left(PZW1_{N_Z = 1.0} + \Delta PZW1 \right) - 2.0\, N_Z\, (W_{WOP}) \left(\frac{F}{R} - 1 \right) +$$

$$PZH_{N_Z = 1.0} + \Delta PZH \tag{124}$$

or:

$$N_Z = \frac{A(PZW1_{N_Z = 1.0} + \Delta PZW1) + PZH_{N_Z = 1.0} + \Delta PZH}{W + 2.0\, (W_{WOP}) \left(\frac{F}{R} - 1 \right)} \tag{125}$$

where $PZW1_{N_Z = 1.0}$ is obtained using equation (110), $PZH_{N_Z = 1.0}$ is obtained using equation (111), A is obtained using equation (112), F/R is the same as that used in equation (102), and incremental gust loads are:

$$\Delta PZW1 = 0.100354\ Kg\ C_{L\alpha WF}\, S_W\, V_E \tag{126}$$

$$\Delta PZH = 0.100354\ Kg\ C_{L\alpha H}\, S_H\, V_E$$

Where $C_{L_{\alpha WF}}$ is obtained using equation (68) and $C_{L_{\alpha H}}$ is obtained using equation 19 or 23 of Volume III, Section II.

Limit airload on the components are then determined as follows:

$$PZW1 - PZW1_{N_Z = 1.0} + \Delta PZW1 \qquad (127)$$

$$PZW4 = -\ 2.0\ N_Z\ (W_{WOP})\left(\frac{F}{R} - 1\right) \qquad (128)$$

$$PZH = PZH_{N_Z = 1.0} + \Delta PZH \qquad (129)$$

$$PZN = (A - 1)\ PZW1 \qquad (130)$$

Airplane pitching acceleration, $\dot{Q}$, is determined as follows:

$$\dot{Q} = -\ [(XN-XCG)\ PZN + (XW1 - XCG)\ PZW1 + (XW4 - XCG)\ PZW4 + (XH - XCG)\ PZH]\ /\ 12\ I_y \qquad (131)$$

LATERAL GUST CONDITION

The lateral gust condition consist of a 50 fps lateral gust encounter superimposed on a 1.0 g trimmed condition.

Component limit airloads PZW1, PZW4, PZH, and PZN are determined using equations 110, 102, 111, and 118, respectively, with $N_Z = 1.0$ and $\delta_F = 0$.

Component limit airloads P_{Y_N} and $P_{Y_{VT}}$ are determined using equations 138 and 139, respectively, from Volume III, Section II.

Airplane yawing acceleration, $\dot{R}$, and side load factor, Ny, are determined using equations 140 and 141, respectively, from Volume III, Section II.

YAWING ACCELERATION CONDITION

The yawing acceleration condition is an arbitrary condition where a specified value of yawing acceleration is caused by a load on the vertical tail and is superimposed on a 1.0 g trimmed condition.

Component limit airloads PZW1, PZW4, PZH, and PZN are determined using equations 110, 102, 111, and 118, respectively, with $N_Z = 1.0$ and $\delta_F = 0$.

Equations 142 and 143, of Volume III, Section II, are used to determine vertical tail limit airload, P_{yVT}, and airplane side load factor, Ny, respectively.

LIFTING SURFACE LIMIT AIRLOAD SHEARS AND MOMENTS

Lifting surface unit airload shears and moments have been determined (for each type of distribution) such that the panel load (per side including the carry-over load on the body) is equal to unity. Therefore, limit airload shears and moments are obtained by multiplying the unit values by the limit panel loads.

WING LIMIT AIRLOAD SHEARS AND MOMENTS

Wing airload shears, bending moments, and torsional moments at the selected η stations for weight analysis along the load reference line are determined for a specific flight condition, as follows:

$$Y_\Lambda = (b/2)/\text{Cos}\,\Lambda_R = Y/\text{Cos}\,\Lambda_R \tag{132}$$

$$S_{Z_\Lambda} = [PZW1(USZ1) + PZW2(USZ2) + PZW3(USZ3) + PZW4\ (USZ4)] \div 2 \tag{133}$$

$$M_{X_\Lambda} = [PZW1\ (UMXT1) + PZW2\ (UMXT2) + PZW3(UMXT3) + PZW4\ (UMXT4)] \div 2 \tag{134}$$

$$M_{Y_\Lambda} = [PZW1\ (UMYT1) + PZWZ\ (UMYT2) + PZW3\ (UMYT3) + PZW4\ (UMYT4)] \div 2 \tag{135}$$

where the unit shears and the unit bending and torsional moments are obtained from equations 80, 82, and 83, respectively, for each type of distribution.

Limit airload shear and moments of the side of the body stations, Y_{BS}, in the body reference system are obtained using unit values from equations 87, 88, and 89 for each type of distribution.

$$S_{Z_{(SOB)}} = [PZW1\ (USZW(B)1) + PZW2\ (USZW(B)2) +$$

$$PZW3\ (USZW(B)3) + PZW4\ (USZW(B)4)] \div 2 \qquad (136)$$

$$M_{X_{(SOB)}} = [PZW1\ (UMXW(B)1) + PZW2\ (UMXW(B)2) +$$

$$PZW3\ (UMXW(B)3) + PZW4\ (UMXW(B)4)] \div 2 \qquad (137)$$

$$M_{Y_{(SOB)}} = [PZW1\ (UMYW(B)1) + PZW2\ (UMYW(B)2) +$$

$$PZW3\ (UMYW(B)3) + PZW4\ (UMYW(B)4)] \div 2 \qquad (138)$$

The total limit carry over airload on the body, PZB(W), and its CP, XBB(W), are determined as follows using unit values from equations 93 and 95:

$$PZB(W) = PZW1\ (UPZB(W)1) + PZW2\ (UPZB(W)2) +$$

$$PZW3\ (UPZB(W)3) + PZW4\ (UPZB(W)4) \qquad (139)$$

$$XBB(W) = X_{RW} + [PZW1\ (UPZB(W)1)\ DXB(W)1 +$$

$$PZW2\ (UPZB(W)2)\ DXB(W)2 + PZW3\ (UPZB(W)3)\ DXB(W)3 +$$

$$PZW4\ (UPZB(W)4)\ DXB(W)4] \div PZB(W) \qquad (140)$$

EMPENNAGE LIMIT AIRLOAD SHEARS AND MOMENTS

Limit airload shears and bending and torsional moments are determined using equations 153 through 182, in Volume III, Section II.

Section III

COMPUTER PROGRAM DESCRIPTION

GENERAL DESCRIPTION

The flexible airloads stand-alone program BFCNTL, has been developed to determine airplane component limit airloads, including effects of wing flexibility for specific flight case conditions. The limit airloads consist of the airload and center of pressure (CP) for each airplane component and airload shear, bending moment, and torsion distributions on wing and empennage surfaces.

Punched card output data are in a format that is compatible for use as an optional external input to the SWEEP program. Input data are generated by the SWEEP data generation program as punched card data such that the operation of the stand-alone program requires no further effort other than setting up the program decks and the preparation of a control data card.

PROGRAM FUNCTIONS

The flexible airloads main program, BFCNTL, utilizes three main subroutines and nine other subordinate subroutines. The main subroutines are USPANF, BNLDSF, and SPABMF.

Subroutine USPANF is used to determine lifting surface unit airload shears, moments, CP's and lift curve slopes for a specified mach number and altitude. For the empennage (horizontal and vertical tail) surfaces, the methods used are described in Volume III, Section II. For the wing, methods used are described Section II herein.

Subroutine BNLDSF is used to determine the gross limit airload and CP on each of the airplane components and the airplane inertia factors for the specified case conditions. Methods employed are described in Section II.

Subroutine SPABMF is used to determine limit airload shear, bending moment, and torsion distributions on lifting surfaces for a specific flight condition. For empennage surfaces, the methods described in Volume III, Section II, are used. For the wing, methods used are described in Section II herein.

The purposes of other subordinate subroutines are as follows:

- DECRD - Reads and stores input data in assigned dimension region
- RERDAT - Rearranges and stores input data in assigned locations
- CØDIM2 - Curve fitting interpolation routine for determination of a value on a single curve
- FCØDM2 - Curve-fitting interpolation routine for the determination of a value from a family of curves.
- ATMØS - Determines the standard atmosphere density and the speed of sound for a given altitude
- WFLEX - Determines the flexible wing airload distribution data for given types of rigid wing and load data
- FLXSIC - Determines wing structural influence coefficient data required by WFLEX
- GLSQ - Gives the solution to a system of linear equations.
- MATRIT - Routine for printing matrices by rows or columns

The calling-called matrix for the program, showing the interdependence of the subroutines, is shown in Figure 4.

MAIN PROGRAM - BFCNTL

The main program, BFCNTL, performs the following functions:

1. Reads in input ND, BC, and BF data arrays of which BC and BF are the punched card outputs from the SWEEP II data generation program.
2. Rearranges BC input array and sets up flight condition data for subroutine usage.
3. Calls subroutines and transfers data required to perform the airload calculations.
4. Punches card output (and prints) data containing component limit airloads and CP's and the wing and empennage limit airload shear and moment distributions.

Calling \ Called	RERDAT	DECRD	USPANF	BNDLSF	SPABMF	CØDIM2	FCØDM2	ATMØS	WFLEX	FLXSIC	GLSQ	MATRIT
BFCNTL (MAIN)	x	x	x	x	x							
USPANF	x					x	x	x	x			
WFLEX										x	x	x
FLXSIC						x						
BNLDSF						x						
RERDAT		x										
FCØDM2						x						

Figure 4. Calling-called matrix for flexible airloads stand-alone program.

Methods described in Section II are used in the coding of the program. The logical flow chart for the main program, BFCNTL, is shown in Figure 5, and detail flow charts and program listing are presented in Appendix A.

PROGRAM DECK SETUP

The program deck setup is illustrated in Figures 6 and 7. The total deck setup must follow the blocked order shown. Twelve subordinate subroutines may be arranged in any order, but the total subroutine block must be immediately behind the main program deck. When only one case is to be run, the execute card must follow the last card of DP data set.

When multiple cases are to be run, subsequent-case data must be arranged as shown in Figure 7 and placed immediately behind the first case. The execute card must then follow the last-case DP data termination card.

INPUT DATA

Input data for the program consist of a user-prepared ND array and the BC and BF arrays produced by SWEEP data generation option.

The input ND data array is an integer array on one card containing control factors shown in Table 1. The flexible loads program uses some coding procedures which are identical to those contained in the airloads estimation program in Volume III. Consequently, some of the control factors listed in Table 1 are identical to those in Volume III. To simplify the coding procedures, identical control factors are located in the same card columns; some columns are left blank; and some columns contain relocated and new control data.

Figure 1 and Table 2 show basic conditions produced for each of the various case numbers. Any basic condition not specifically defined by the chosen case number will not be produced, even if the type factor ND(28) through ND(36)) is entered as yes. These type factors are used for selection or rejection of only those basic flight conditions described by the chosen case number.

BC data array contains (1) airplane design weights, centers of gravity locations, and moments of inertia, (2) design limit load factors, (3) design speed-altitude points, (4) airplane dimensional and geometric data, and (5) span stations on the lifting surfaces selected for weight analysis. These data are on punched cards in the E-format that is compatible with decimal read subroutine DECRD. Input BC array is shown in Table 3.

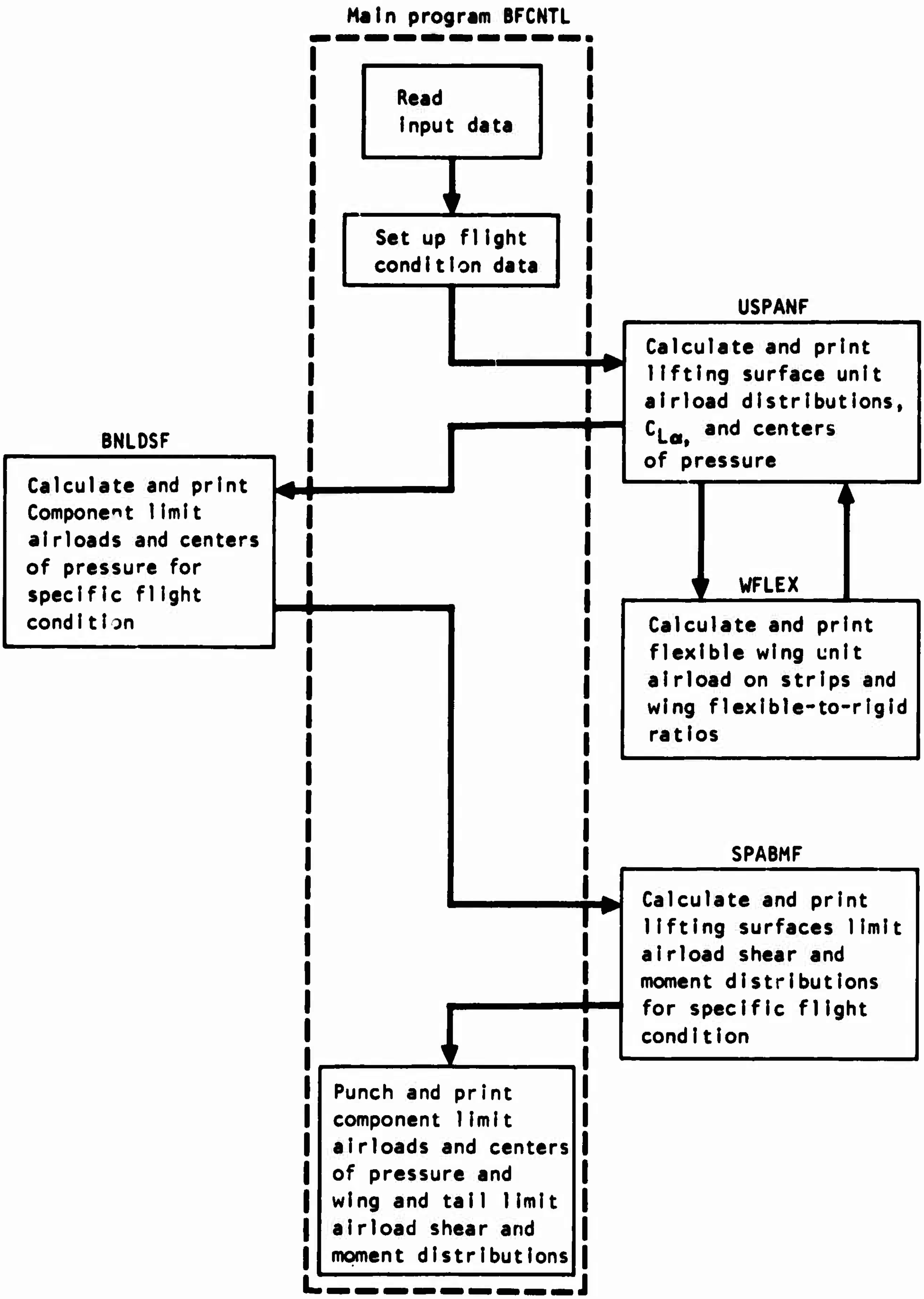


Figure 5. Logical flow chart for flexible airloads stand-alone program.

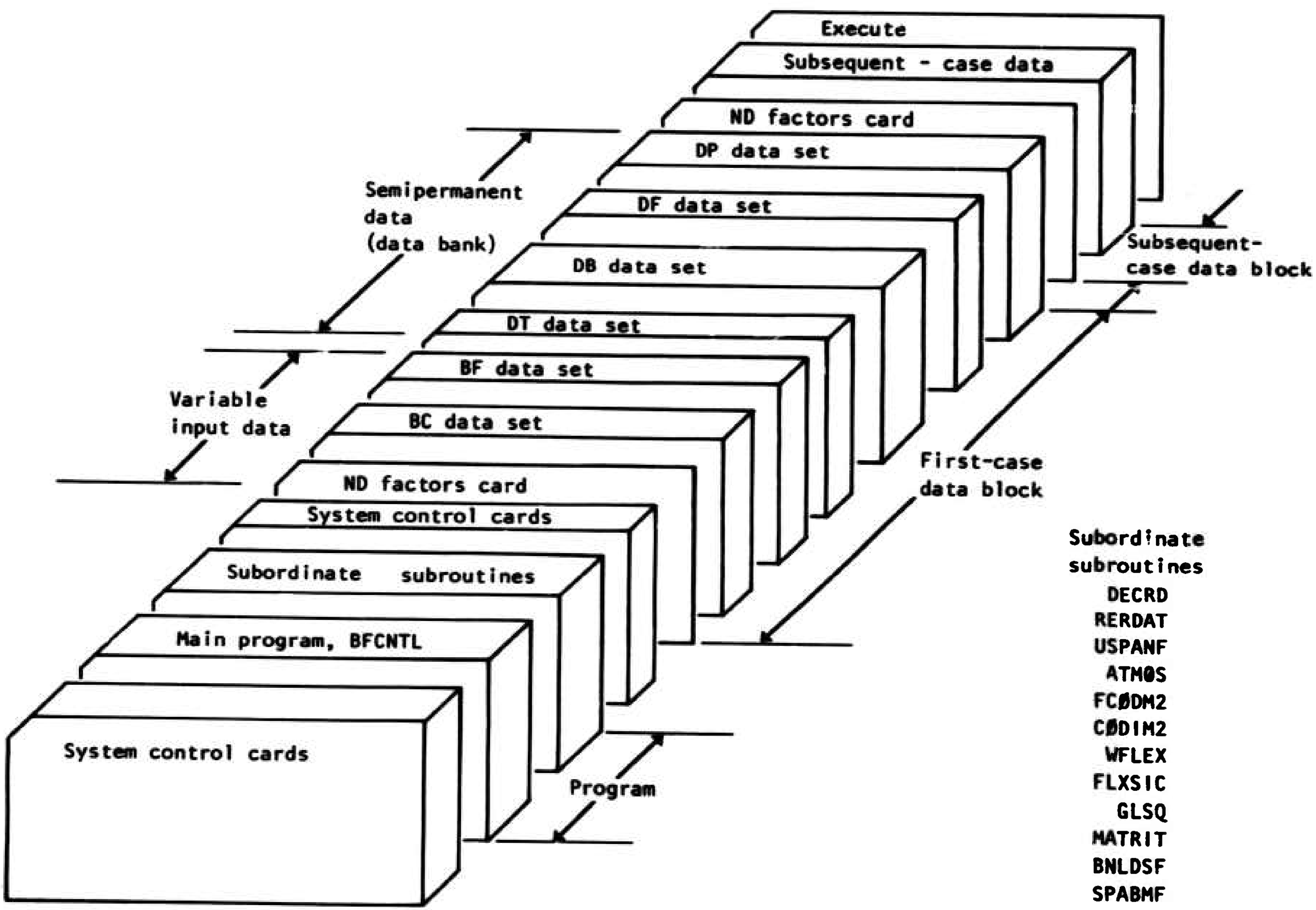


Figure 6. Flexible airloads program deck setup.

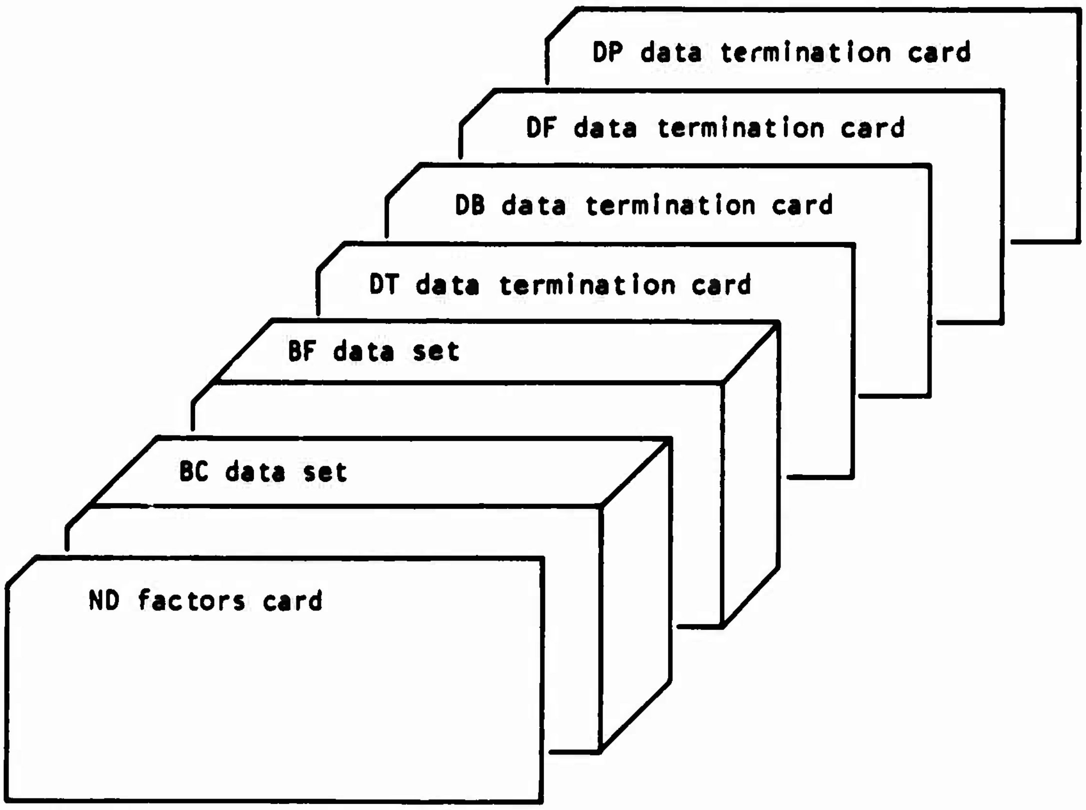


Figure 7. A subsequent-case data block setup.

BF data array contains (1) design speeds at 20,000 feet, (2) wing elastic axis location, (3) exposed wing strip weights and center of gravity (X/C) locations, and (4) wing spanwise variation of the stiffness parameters EI and GJ. These data are shown in Table 4, locations 1 through 106, and are on punched cards in the same format as the BC data.

SEMIPERMANENT DATA

The program deck setup contains data sets DT, DB, DF, and DP, which comprise semipermanent (fixed) data. These data sets contain aerodynamic data used by subroutine USPANF in the determination of lifting surface unit airload distributions. These data sets are the same as that contained in the SWEEP airloads module data bank.

DT data set array is shown in Table 5. This data set contains η-span stations and taper ratios applicable to spanwise loading parameters of DB and DP data sets, and contains the variation with mach number of compressible section lift-curve slope parameter, B/K., and section CP, X/C, for the wing and empennage.

DB data set array is shown in Table 6. This data set contains subsonic span loading parameter (C_ℓ C/C_L C_{AV}), variation of compressible lifting surface lift-curve slope parameter ($BC_{L\alpha}/K$) versus compressible sweep parameter (λ_B) and aspect ratio parameter (BA/K_1) for 16 combinations of span station (η) and taper ratio (λ).

The DF data set array is shown in Table 7. This data set contains section CP (X/C) and flap lift effectiveness parameter (K_{CF}) variation with flap chord ratio (C_F/C_W) and flap lift spanwise loading parameter (C_ℓ $C/C_{L\alpha}CAV$) variation with span station (η) for 10 flap span ratios (b_F/b_W).

DP data set array is shown in Table 8. This data set contains supersonic span loading parameter ($2\Gamma/V\alpha b$) variation with sweep parameter (Bm) and aspect ratio parameter (BA) for 16 combinations of span station (η) and taper ratio (λ).

Numeric values of DT, DB, DF, and DP data contained in the program data bank are presented in Volume III, Section II.

SUBROUTINE DESCRIPTIONS

SUBROUTINE RERDAT

Subroutine RERDAT reads in and rearranges the input BC data set described in Table 3 to data locations shown in Table 9. The subroutine also interpolates EI and GJ data BF(47) through BF(106) to obtain EI and GJ data for subroutine WFLEX, as shown in data locations BF(114) through BF(173) of Table 4. BF data items BF(107) through BF(113), BF(174), and BF(175) are added to the input data list. The rearranged BC data locations and the complete BF data sets are then used in the main program and the subprograms.

Subroutine RERDAT logical flow chart and its program listing are shown in Appendix A.

SUBROUTINE DECRD

Entry Name

DECRD provides the facility for reading a variable number of pieces of real data from the input device and storing them in specified elements (either sequential or nonconsecutive) or an array.

Usage

CALL DECRD (APR)

APR - The name of the real array to be read.

This routine is particularly helpful in programs in which the number of input elements varies from case to case. Only information specified is actually read into storage; remaining elements of the array are unchanged.

Data are usually written on the form Fortran Fixed 10 Digit Decimal Data. Each card must contain an index: an integer written in columns 2 through 12. The five data fields of 12 columns each (columns 13 through 72) contain input data of the real type. However, any data field may be left blank to indicate that the corresponding location in core is not to be changed. Columns 73 through 80 contain the identification.

The index defines the location of the first piece of data on the card within the array specified as the argument. This integer must be written to the extreme right of the field. If the name of the array is not subscripted in the CALL statement, the index can be considered equivalent to the subscript of a one-dimensioned array. For example, if the argument in the CALL is the nonsubscripted array name, ARR, and the index is 10, the first piece of data on the card (columns 13 through 24) will be read into ARR (10); the third piece of data (columns 37 through 48) will be read into ARR (12).

For an array with multiple subscripts, the index should be computed so that the particular element can be defined by a single number. The index may not be zero or blank.

All data items must be of the real type; they are written following the rules for input with E-type format specification. If an exponent is written, it must be at the extreme right of the field.

1. If the number is written without either an exponent or a decimal point, the point is assumed to be at the extreme right of the field (as if read with an E12.0 format).

2. If the decimal point is explicitly written, the number may be positioned anywhere in the field.

3. If no decimal point is written but an exponent is furnished, the point is assumed to be immediately to the left of the exponent.

When a field is left blank, no information is read into the location corresponding to this field; the information already in this location is unaltered. A negative zero is read as zero.

Reading is terminated by putting a negative sign in column 1 of the last card to be read.

Error

If card columns 2 to 12 are blank or zero, the comment, "DECRD ER. CARD = (bad card image)" is printed and execution of the job is terminated. If a field contained in columns 13 through 72 cannot be converted by the specified format, an error code is printed and execution of the job is terminated.

Method

Data fields of each card are converted twice, using two formats, SF12.0 and 10A6. The A-type conversion is used to check for blank fields. If the field is not blank, the result of the E-type conversion is stored in the proper element of the specified array. After reading each card, a test is made for a negative sign in the first field; reading is terminated if the sign is negative. The numerical data cards processed by this subroutine is discussed in Section I of Volume IX.

SUBROUTINE USPANF

Subroutine USPANF is used to determine the lifting surface unit airload shears, moments, CP's and lift-curve slopes for a combination of mach number and altitude specified by the main program.

Methods used for the horizontal and vertical tail surface are the same as those described in Volume III, Section II, for the SWEEP program.

Methods used to develop the wing unit airload data include the airload distributions caused by wing bending and torsional deflections resulting from (1) lift due to angle of attack, (2) lift due to flap deflection, and (3) inertia load due to vertical acceleration. The applicable methods are described in Section II herein.

FUNCTION CØDIM2

Function CØDIM2 is an interpolation routine for the determination of a point on a single curve fitted through four points.

FUNCTION FCØDM2

Function FCØDM2 is an interpolation routine for the determination of a point from a family of fitted curves. The subroutine utilized CØDIM2 for each family curve interpolation.

SUBROUTINE ATMØS

Subroutine ATMØS is used to determine the 1962 U.S. Standard Atmosphere density and speed of sound for a given geometric altitude. The methods employed can be followed in the logical flow chart and the program listing shown in Appendix A.

SUBROUTINE WFLEX

Subroutine WFLEX solves the wing static aeroelastic problem for the α, δ FLAP, and vertical inertia load effects. The subroutine uses distributed rigid airload data, along with flight condition data and structural influe-ence coefficients from subroutine FLXSIC. The logical flow chart and the program listing are shown in Appendix A.

Usage

All input-output data, except printed results and diagnostic printed results, are passed through the call statement.

CALL WFLEX (AFW, AFWCP, AFWF, AFWDF, F, YEIGJ, EI, GJ, CR, BØ2, BLBS, ANGLE, FSLERT, ANGERA, FSEAØ, WLAMDA, Q, CLAR, EØTA, SW, NØEIGJ, NS, ICALCS, IPRINS, IPRINA)

Definition of call statement variables:

( ) = program dimensions

Variable ( )	Data Type	Description
AFW(10,3)	INPUT	Rigid load distributions on NS number of chordwise strips. Stored by columns: Col 1, α load; col 2, δ_{FLAP} load; col 3, inertia load for N_Z = 1.
AFWCP(10,3)	INPUT	Chordwise centers of pressure for rigid loads provided in AFW. These X/C values are stored by columns.
AFWF(10-3)	OUTPUT	Total flexible load distributions, by column.
AFWDF(10,3)	OUTPUT	Delta flexible load distributions, by column.
F(3,4)	OUTPUT	Summation of load distributions: Col 1, Σ rigid loads; col 2, Σ total flexible loads; col 3, Σ delta flexible loads; col 4, flexible-to-rigid ratios.
YEIGJ(20)	INPUT	Elastic axis y-coordinates for wing EI and GJ. NOTE: YEIGJ (1) must equal zero, (in.).
EI(20)	INPUT	EI, wing bending stiffness (lb in.^{2}).
GJ(20)	INPUT	GJ, wing torsional stiffness (lb in.^{2}).

Variable ( )	Data Type	Descriptions
CR	INPUT	Chord of wing at fuselage ℄ (in.).
BØ2	INPUT	Wing semispan, b/2 (in.).
BLBS	INPUT	Butt line of body side (in.).
ANGLE	INPUT	Angle of wing leading edge sweep (deg).
FSLERT	INPUT	Fuselage station of wing leading edge at fuselage ℄ (in.).
ANGEA	INPUT	Angle of wing elastic axis sweep (deg)
FSEAØ	INPUT	Fuselage station of elastic axis at ℄ (in.).
WLAMDA	INPUT	Wing taper ratio, $\lambda_W = \frac{\text{chord tip}}{\text{chord ℄}}$
Q	INPUT	Dynamic pressure, q (psf).
CLAR	INPUT	$C_{L\alpha}$/RAD for the wing.
EØTA	INPUT	Exposed/total load ratio, for distributions.
SW	INPUT	Wing area (ft^2).
NØEIGJ	INPUT	Number of values in the YEIGJ, EI and GJ lists, 20 maximum.
NS	INPUT	Numbers of load strips on the exposed wing, 10 maximum.
ICALCS	INPUT	Controls calculation of SIC matrix: 0 - Do not calculate SIC 1 - Do calculate SIC

Variable ( )	Data Type	Descriptions
IPRINS	INPUT	Controls printing of SIC matrix and other diagnostic data from subroutine FLXSIC: 0 - Do not print SIC 1 - Do print SIC NOTE: IPRINS has no effect if ICALCS = 0
IPRINA	INPUT	Controls printing of diagnostic data from subroutine WFLEX: 0 - Do not print diagnostic data 1 - Do print diagnostic data

Restrictions

The number of load strips, NS, may not exceed 10, and the number of EI and GJ values, NØEIGJ, may not exceed 20.

Error Returns

If NS is greater than 10, or NØEIGJ is greater than 20, an error message will be printed and execution will be stopped.

Method

The method is described under the heading "Wing Aeroelastic Distributions" in Section II. Note that when using subroutine GLSQ to obtain the solution, the D-matrix must be reloaded into A for each load effect, because GLSQ destroys A in the solution process. Also, note that region A must be cleared prior to loading D for at least two more rows than the number of rows in D, in order for the GLSQ solution to work.

Operational Notes

Rigid load distributions that enter into WFLEX are for loads on the exposed wing panel only and can be handled several ways. But regardless of the manner in which it is used, the α load, per radian, on the exposed wing panel due to a unit angle of attack is computed in the program as:

$$\text{LOAD} = \text{CLAR*EØTA*Q*}\frac{\text{SW}}{2}\text{*} \sum_{I=1}^{NS} \text{AFW(I,1)}$$

The variable EØTA in application to this flexible airloads program is equated to 1.0.

SUBROUTINE FLXSIC

Using wing geometry and wing EI and GJ distributions as input data, subroutine FLXSIC computes wing structural influence coefficient for use in the static aeroelastic solution that is calculated in subroutine WFLEX. The logical flow chart and program listing are shown in Appendix A.

Usage

All input-output data, except printed diagnostic results, are passed through the call statement.

CALL FLXSIC (SICBAR, YEIGJ, EI, GJ, CR, BØ2, BLBS, ANGLE, FSLERT, ANGEA, FSEAØ, WLAMDA, XØCFWD, XØCAFT, NØEIGJ, NS, IPRINS)

Definition of call statement variables:

( ) = Program dimensions

Variable ( )	Data Type	Description
SICBAR(10,20)	OUTPUT	Matrix of strip slopes due to loads at the SIC points (radians/lb).
YEIGJ(20)	INPUT	Elastic axis y-coordinates for wing EI and GJ. NOTE: YEIGJ(1) must equal zero, (in.).

Variable ( )	Data Type	Description
EI(20)	INPUT	EI, wing bending stiffness (lb-in.^{2}).
GJ(20)	INPUT	GJ, wing torsional stiffness (lb-in.^{2}).
CR	INPUT	Chord of wing at fuselage ℄ (in.).
BØ2	INPUT	Wing semispan, b/2 (in.).
BLBS	INPUT	Butt line of body side (in.).
ANGLE	INPUT	Angle of wing leading edge sweep (deg).
FSLERT	INPUT	Fuselage station of wing leading edge at fuselage ℄ (in.).
ANGEA	INPUT	Angle of wing elastic axis sweep (deg).
FSEAØ	INPUT	Fuselage station of elastic axis at ℄ (in.).
WLAMDA	INPUT	Wing taper ratio, $\lambda_W + \frac{\text{tip chord}}{℄\ \text{chord}}$
XØCFWD	INPUT	Strip X/C forward, used as 0.15.
XØCAFT	INPUT	Strip X/C aft, used as 0.65.
NØEIGJ	INPUT	Number of values in the YEIGJ, EI and GJ lists, 20 maximum.
NS	INPUT	Number of load strips on the exposed wing, 10 maximum.
IPRINS	INPUT	Controls printing of SIC matrix and other diagnostic data: 0 - Do not print SIC and diagnostic 1 - Do print SIC and diagnostic

Restrictions

The number of load strip, NS, may not exceed 10, the number of EI and GJ values may not exceed 20, and YEIGJ(1) must equal 0.

Error Returns

In the logic of this routine, it is possible for $\bar{y}$ in the swept elastic axis system to become negative for a highly swept wing. If it does, this subroutine will print out an error message and execution will be stopped.

Method

The method is described under the heading "Wing Structural Influence Coefficients," in Section II. Coding, with the exception of the technique used in integration of equation 44 is self-explanatory. Integration of equation 44 is accomplished trapezoidally after the input EI and GJ data are first interpolated, using the CØDIM2 subroutine, to obtain 20 intervals between the ℄ and the point at which the deflection is being computed. For example:

$$\int_0^{\bar{y}} f(\bar{\lambda})\, d\lambda = \sum_{i=2}^{21} \left(f(\bar{\lambda})_{i-1} + f(\bar{\lambda})_i \right) \frac{\Delta\lambda}{2}$$

where

$$\Delta\bar{\lambda} = \bar{y}/20$$

Note that if the value of $\bar{y}$ ever exceeds the value of $\bar{\eta}$, the integration upper limit is changed to $\bar{\eta}$ by simply zeroing out the value of the functions of $\bar{\lambda}$ in both the bending and torsion integrals.

Recommended Operational Data Setup

In the formulation of the aeroelastic solution that uses the SIC matrix from this subroutine, the wing elastic axis (EA) has been carried inboard of the side of the body to the body centerline. In general, the wing carry-through structure does not extend along the wing EA, but is directed across the airplane. Since bending across the airplane does not affect wing angle of attack, and the wing is effectively fixed in torsion at the side of the body, stiffness EI and GJ inboard of the body side should be arbitrarily greatly increased.

EI and GJ recommended data setup:

$$y_{BODY\ SIDE} = \frac{BL_{BS}}{\cos \Lambda_{EA}}$$

YEIGJ(1) = 0.	EI(1) = 10 EI_{BS}	GJ(1) = 10 GJ_{BS}
(2) = 0.25 $\bar{y}_{BS}$	(2) = 10 EI_{BS}	(2) = 10 GJ_{BS}
(3) = 0.50 $\bar{y}_{BS}$	(3) = 10 EI_{BS}	(3) = 10 GJ_{BS}
(4) = $\bar{y}_{BS}$	(4) = EI_{BS}	(4) = GJ_{BS}
(5) = 1.10 $\bar{y}_{BS}$	(5) = See Note	(5) = See Note

NOTE: Data for point 5 and on should be taken from the EI and GJ curves. Sufficient data points should be input (20 maximum) to give good definition of the curves when fitted with CØDIM2.

Subroutines USPANF through RERDAT set up EI and GJ values in accordance with the preceding note and interpolate EI and GJ input data BF(47) through BF(106) to obtain 15 additional points outboard of YEIGJ(5). Resulting EI and GJ data are then located in BF(114) through BF(173), as shown in Table 4, for transfer to this subroutine.

SUBROUTINE GLSQ

This FORTRAN subprogram gives the least squares solution to a system of overdetermined linear equations Bx = C, where B is an N x M matrix, with

N ≥ M and C a column vector of dimension N. The logical flow chart and the program listing are shown in Appendix A.

Calling Sequence

CALL GLSQ (A, X, IL, N, M, ALPHA, E1, E2)

Definition of call statement variables:

( ) = program dimensions

Variable ( )	Data Type	Description
A(25,26)	INPUT	The augmented matrix B,C of at least dimension (M+2) x (M+1) or N x (M+1), whichever is greater.
X(26)	OUTPUT	The vector where the solution is stored and must be of at least dimension M + 1.
IL(26)	INPUT	A temporary vector of at least dimension M+1.
N	INPUT	Number of rows of B.
M	INPUT	Number of columns of B.
ALPHA	OUTPUT	The square root of the sum of the squares of the residuals.
E1 and E2	INPUT	Two nonnegative numbers which are small compared to the size of the numbers in the input matrix.

Restrictions

This subprogram has a dimension statement A(25, 26), X(26), IL(26). The calling program must be dimensioned exactly the same. The input data, A, are destroyed during the computation.

Method

The method is discussed under "Wing Aeroelastic Distributions," in Section II. In the triangularization process, if any number to be annihilated is already less in magnitude than E1, it is considered to be zero and the computations to annihilate the element are omitted.

Let bj denote the j^{th} column of B. If the routine finds that b_k is a linear combination of $b_1, \ldots, b_{k-1}$, then it sets the k^{th} component of x to zero. The routine considers that such a linear combination holds whenever numbers $\lambda_1, \ldots, \lambda_{k-1}$ can be found so that the length of the vector

$$b_k - (\lambda_1 b_1 + \ldots + \lambda_{k-1} b_{k-1})$$

is less than E2.

Operational Notes

When using GLSQ to solve an exactly determinate set of linear equations, the dimension of the augmented matrix must be at least A(M+2, M+1), and the region must be cleared prior to loading the augmented matrix.

SUBROUTINE MATRIT

Subroutine MATRIT prints matrices by row or column in format IP8E13.5 and with a heading statement that is transmitted in the calling sequence. The logical flow chart and the program listing are shown in Appendix A.

Usage

CALL MATRIT (AMN, NR, NC, NRMAX, MTYPE, IPRIN, HEAD)

Definition of call statement variables:

( ) = Program Dimensions

Variable ( )	Data Type	Description
AMN(1)	INPUT	Matrix to be printed.
NR	INPUT	Number of rows in AMN.
NC	INPUT	Number of column in AMN.
NRMAX	INPUT	Maximum number of rows in AMN, dimension in calling program.
MTYPE	INPUT	Type of matrix: 1 - real -1 - complex (do not use)
IPRIN	INPUT	Print by rows or columns: 1 - print by rows 2 - print by columns
HEAD(100)	INPUT	Format of matrix heading; for example, 24H (IHI 20X, 11HMASS, MATRIX).

SUBROUTINE BNLDSF

Subroutine BNLDSF is used to determine the limit airloads and CP's on the airplane components, and up inertia factors for the flight conditions specified by the main program. There are five types of flight conditions for which the airloads can be determined; namely, (1) the balanced maneuver condition, (2) the pitching acceleration condition, (3) the vertical gust condition, (4) the lateral gust condition, and (5) the yawing acceleration condition. The methods used in deriving the component loads for these conditions are presented in Section II and include the aeroelastic effects of wing flexibility.

The subroutine BNLDSF logical flow chart and the program listing are shown in Appendix A.

SUBROUTINE SPABMF

Subroutine SPABMF is used to determine the net limit airload shear and moments along the load reference line on the wing, horizontal tail, and vertical tail surfaces. The methods employed are described in Section II. The logical flow chart and the program listing are shown in Appendix A.

OPERATING CORE, TCØM

The program operating core, TCØM, is dimensioned to 4,400 locations and is blocked into data regions as shown in Table 10. A description and the location of the data within each data block can be found in the tables referenced by Table 10.

OUTPUT DATA DESCRIPTION

GENERAL

Primary output of the program is a deck of cards containing airplane component limit airloads, CP locations, and wing and empennage limit airload shears and moments at the spanwise stations along the load reference line selected for weight analysis. Punched card output is in a format for use as an optional airloads input to the SWEEP program. Printout of other data is also included for visual inspection of the results of final and intermediate calculations.

PUNCHED CARD OUTPUT

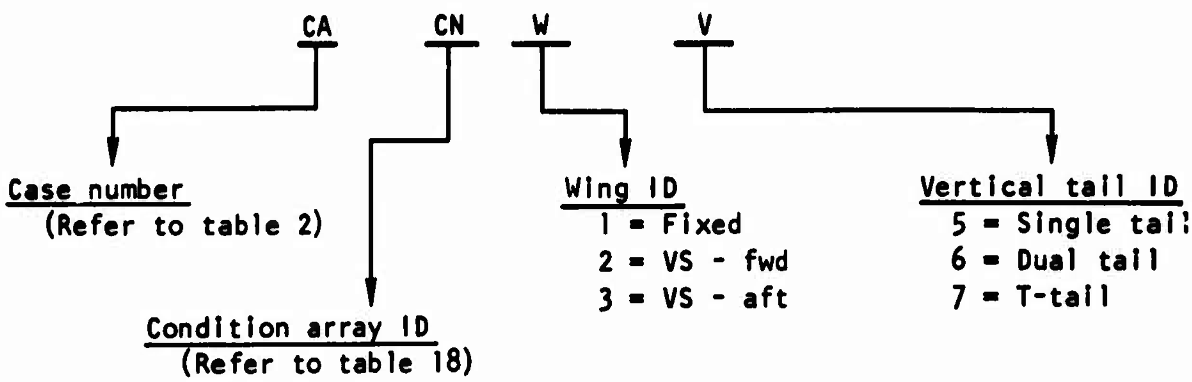
The output punched cards list limit airloads data in an E-format to be read by subroutine DECRD in SWEEP. A sample printout of data on the punched cards is shown in Table 17. Each card contains a DECRD array index number, followed by five decimal data items and the card identification number. A "yes" in control factor ND(40), per Table 1, will provide the punched card output.

Output data array is described in Table 15. The index number punched on each card corresponds to the location within the array for the first item of decimal data on the card.

Condition identification number and component loads identification numbers are assigned by the program and are included in the punched output deck for each condition. Component loads identification numbers also appear in the printed output.

Condition ID

The condition identification number is punched in columns 13 to 24 of card 1 and is defined as follows:



Fuselage Loads ID

The fuselage loads identification number is punched in columns 25 to 36 of card 1 and appears on the components load and CP printed page. It is defined as follows:

CA CN 0

Wingloads ID

The wingloads identification number is punched in columns 25 to 36 of card 5 and appears on the wing spanwise loads printed page. It is defined as follows:

CA CN W

Horizontal Tail Loads ID

The horizontal tailloads identification number is punched in columns 61 to 72 of card 15 and appears on the horizontal tail spanwise loads printed page. It is defined as follows:

CA CN 4

Vertical Tail Loads ID

The vertical tailloads identification number is punched in columns 37 to 48 of card 26 and appears on the vertical tail spanwise loads printed page. It is defined as follows:

CA CN V

Punched Card ID

The punched output identification and card sequence number is punched in columns 73 to 80 and is defined as follows:

1 CA CN SEQ

Signifies sweep 1 data   Three-column sequence No.

PRINTED OUTPUT DATA

The program will always print the data in Tables 19 through 28. With a "yes" in ND(41), per Table 1, a listing of the data on the punched output cards will be printed as shown in Table 17. With a "yes" in ND(44), per Table 1, FLXSIC matrices will be printed as shown in Tables 29 through 35. With a "yes" in ND (45), per Table 1, WFLEX matrices will be printed as shown in Tables 36 through 38.

Data of Primary Interest

Data of primary interest to the user consist of (1) that which is descriptive of the data that are to be used as optional input to SWEEP, and (2) input data for the main program, BFCNTL.

Table 17 shows a sample printout of the data on the output punched cards. Data items can be identified using Table 15. Table 25 presents a summary of the component limit airloads, CP's, and the airplane inertia factors. Tables 26 through 28 show sample printouts of limit airload shears and moments along the load reference line for the wing, horizontal tail, and vertical tail, respectively. Tables 19 and 20 show sample printouts of the program input BC and BF data sets; the data items can be identified using Tables 3 and 4.

Intermediate Step and Diagnostic Data

Tables of printed data presenced are divided into three groups. The first group consists of intermediate-step results produced by subroutine USPANF as spanwise unit airload distributions for the wing, and horizontal and vertical tails are developed. The second group consists of optional diagnostic matrix data produced by subroutine FLXSIC. The third group consists of optional diagnostic matrix data produced by subroutine WFLEX.

Intermediate-Step Data

Tables 21, 23, and 24 are produced by subroutine USPANF. Table 22 is produced by subroutine WFLEX, which is subordinate to subroutine USPANF. These printed data are not optional in the current configuration of the flexible airloads stand-alone program. Table 21 shows sample printouts of the rigid loading data extracted from the data bank aerodynamic data for the condition mach number and the subject air vehicle configuration. Table 22 shows sample printouts of rigid loading and CP data inputed to subroutine WFLEX by subroutine USPANF, and aeroelastic loading data returned to subroutine USPANF by subroutine WFLEX. Table 23 shows sample printouts of final unit spanwise loading distributions for the wing, and horizontal and vertical tails developed by subroutine USPANF. Table 24 shows sample printouts of spanwise variation of unit shear, bending moment, and torque for three surfaces as developed by subroutine USPANF and stored in data region BU.

FLXSIC Diagnostic Data

Tables 29 through 35 present optional diagnostic data produced by subroutine FLXSIC. If control factor ND(44) is assigned a value of 1, these tables will be produced. A value of 0 will eliminate them. Table 29 shows a sample printout of the data inputed to subroutine FLXSIC by subroutine WFLEX. Table 30 shows a sample printout of the elastic axis geometry developed by subroutine FLXSIC. Tables 31 through 35 show sample printouts of the various structural influence coefficient (SIC) matrices developed by subroutine FLXSIC. Subroutine FLXSIC is recalled only when there is a change in wing geometry or stiffness properties.

WFLEX Diagnostic Data

Tables 36 through 38 present optional diagnostic data produced by subroutine WFLEX. If control factor ND(45) is assigned a values of 1, these data will be produced. A value of 0 will eliminate them. Table 36 shows a sample printout of the pertinent aerodynamic data used by subroutine WFLEX. Table 37 shows a sample printout of the aeroelastic D-matrix developed by the subroutine. Table 38 shows sample printouts of the rigid and the resultant flexible loads matrices. Subroutine WFLEX is called whenever mach number, dynamic pressure, wing geometry, wing stiffness properties, or wing weight distribution change.

TABLE 1. ND CONTROL FACTORS CARD

Control Factor	Card Col	ND 13	ND 14	ND 15	ND 23	ND 24	ND 25	ND 26	ND 27
SWEEP A/V class	2								
Fighter		1							
Attack		2							
Bomber I		3							
Bomber II		4							
Cargo-assault		5							
Cargo-transport		6							
Wing Type									
Fixed wing	3,4		-1						
Variable sweep	4		1						
Vertical tail type									
Single tail	5,6			-1					
Dual tail	6			0					
T-tail	6			1					
Loads requirements									
Select components	21,22				-1				
Fuselage No	23,24					-1			
Fuselage Yes	24					1			
Wing No	25,26						-1		
Wing Yes	26						1		
Horizontal tail No	27,28							-1	
Horizontal tail Yes	28							1	
Vertical tail No	29,30								-1
Vertical tail Yes	30								1
Do all components	22,24 26,28 & 30				1	0	0	0	0

TABLE 1. ND CONTROL FACTORS CARD (CONT)

Control Factor		Card Col	ND 28	ND 29	ND 30	ND 31	ND 32	ND 33	ND 34	ND 35	ND 36	ND 40	ND 41
Basic condition types*													
Pos bal flight	No	31,32	-1										
	Yes	32	1										
Neg bal flight	No	33,34		-1									
	Yes	34		1									
Maneuvering flap	No	35,36			-1								
	Yes	36			1								
1 g trim flap	No	37,38				-1							
	Yes	38				1							
Pos vert gust	No	39,40					-1						
	Yes	40					1						
Neg vert gust	No	41,42						-1					
	Yes	42						1					
Lateral gust	No	43,44							-1				
	Yes	44							1				
Pitch acceler	No	45,46								-1			
	Yes	46								1			
Yawing acceler	No	47,48									-1		
	Yes	48									1		
Punch output factors													
Punched output	No	55,56										-1	
	Yes	56										1	
Print check	No	57,58											-1
	Yes	58											1

TABLE 1. ND CONTROL FACTORS CARD (CONCL)

Control Factor		Card Col	ND 42	ND 43	ND 44	ND 45	ND 46
Input control factors -							
No. of values							
YEIGJ, EL, GJ (20 Maximum)		59,60	20				
Wing weight strips		61,62		10			
Diagnostic printing							
FLXSIC matrices	No	64			0		
	Yes	64			1		
MFLEX matrices	No	66				0	
	Yes	66				1	
Case No.		67,68					**

*Basic conditions not specifically defined by the chosen case number will not be produced, even if the type factor is entered as yes. Type factors are used for the selection or rejection of basic conditions described by the chosen case number.

**Enter case number selected from Table 2 (the number must be right-adjusted in the field).

TABLE 2. CASE NUMBER CONDITIONS

Case No.	Condition No.	Condition Type	Mach No.	Altitude
1	104 WV 106 WV 107 WV	+ Bal man. Pitch accel Yaw accel	$M_{L1,1}$	$h_{1,1}$
	108 WV 110 WV 111 WV	+ Bal man. Pitch accel Yaw accel		$h_{1,2}$
	112 WV 114 WV 115 WV	+ Bal man. Pitch accel Yaw accel		$h_{1,3}$
2	208 WV 210 WV 211 WV	+ Bal man. Pitch accel Yaw accel	$M_{L1,2}$	$h_{1,2}$
	212 WV 214 WV 215 WV	+ Bal man. Pitch accel Yaw accel		$h_{1,3}$
3	312 WV 314 WV 315 WV	+ Bal man. Pitch accel Yaw accel	$M_{L1,3}$	$h_{1,3}$
4	401 WV 402 WV 403 WV 405 WV	+ Vert gust - Vert gust Lat gust - Bal man.	$M_{H1,1}$	$h_{1,1}$
	409 WV 413 WV	- Bal man. - Bal man.		$h_{1,2}$ $h_{1,3}$
5	501 WV 502 WV 503 WV	+ Vert gust - Vert gust Lat gust	$M_{H1,2}$ or M_{H1}, 20,000 ft*	$h_{1,2}$ or 20,000 ft*
	509 WV 513 WV	- Bal man. - Bal man.	$M_{H1,2}$	$h_{1,2}$ $h_{1,3}$

TABLE 2. CASE NUMBER CONDITIONS (CONCL)

Case No.	Condition No.	Condition Type	Mach No.	Altitude
6	601 WV 602 WV 603 WV	+ Vert gust - Vert gust Lat gust	$M_{H1,3}$ or M_{H1}, 20,000 ft*	$h_{1,3}$ or 20,000 ft*
	613 WV	- Bal man.	$M_{H1,3}$	$h_{1,3}$
7	704 WV 705 WV 706 WV 707 WV	+ Bal man. - Bal man. Pitch man. Yaw man.	0.90	$h_{1,1}$
	708 WV 709 WV 710 WV 711 WV	+ Bal man. - Bal man. Pitch man. Yaw man.		$h_{1,2}$
	712 WV 713 WV 714 WV 715 WV	+ Bal man. - Bal man. Pitch man. Yaw man.		$h_{1,3}$
8	816 WV	Flap man.	1.5 V_{SO}	SL
9	917 WV	1 g flap trim	1.2 V_{SL}	SL
10	1018 WV 1019 WV 1020 WV 1021 WV	+ Vert gust - Vert gust + Bal man. - Bal man.	$M_{H2,1}$	$h_{2,1}$
	1022 WV 1023 WV	+ Bal man. - Bal man.		$h_{2,2}$
11	1118 WV 1119 WV	+ Vert gust - Vert gust	$M_{H2,2}$ or M_{H2}, 20,000 ft*	$h_{2,2}$ or 20,000 ft*
	1122 WV 1123 WV	+ Bal man. - Bal man.	$M_{H2,2}$	$h_{2,2}$

*Gust conditions maximum altitude is 20,000 feet.

W = 1 = Fixed wing
2 = Variable sweep (fwd)
3 = Variable sweep (aft)

V = 5 = Single vertical tail
6 = Dual vertical tail
7 = T - tail

TABLE 3. BC INPUT DATA SET

LOCATIONS	DESCRIPTIONS	
1	MAXIMUM DESIGN WEIGHT (MDW).	POUNDS
2	CENTER OF GRAVITY STATION (X) AT MDW-VARIABLE SWEEP WING FWD.	INCHES
3	CENTER OF GRAVITY STATION (X) AT MDW-VARIABLE SWEEP WING AFT. -FIXED WING.	INCHES
4	BASIC FLIGHT DESIGN WEIGHT (BFDW).	POUNDS
5	CENTER OF GRAVITY STATION (X) AT BFDW-VARIABLE SWEEP WING FWD.	INCHES
6	CENTER OF GRAVITY STATION (X) AT BFDW-VARIABLE SWEEP WING AFT. -FIXED WING.	INCHES
7	PITCHING MOMENT OF INERTIA (IYY) AT BFDW-VARIABLE SWEEP WING FORWARD.	SLUG-FT SQUARED
8	PITCHING MOMENT OF INERTIA (IYY) AT BFDW-VARIABLE SWEEP WING AFT. -FIXED WING.	SLUG-FT SQUARED
9	YAWING MOMENT OF INERTIA (IZZ) AT BFDW-VARIABLE SWEEP WING FORWARD.	SLUG-FT SQUARED
10	YAWING MOMENT OF INERTIA (IZZ) AT BFDW-VARIABLE SWEEP WING AFT. -FIXED WING.	SLUG-FT SQUARED
11	LANDING DESIGN WEIGHT (LDW).	POUNDS
12	CENTER OF GRAVITY STATION (X) AT LDW.	INCHES
13	LIMIT POSITIVE LOAD FACTOR (NZ) AT BFDW-SUBSONIC.	
14	LIMIT POSITIVE LOAD FACTOR (NZ) AT BFDW-SUPERSONIC.	
15	LIMIT NEGATIVE LOAD FACTOR (-NZ) AT BFDW-NEGATIVE SIGN (-) REQUIRED.	
16	LIMIT LOAD FACTOR (NZ) FOR FLAP DOWN MANEUVER AT MDW.	
17	PITCHING ACCELERATION AT ML FOR BFDW.	RAD./SECOND SQUARED
18	YAWING ACCELERATION AT ML FOR BFDW.	RAD./SECOND SQUARED
19-21	ALTITUDES-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	FEET
22-24	SPEEDS MH-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	MACH NUMBER
25-30	ARE NOT USED IF A/V HAS FIXED WING-ENTER ZEROS.	
25-27	ALTITUDES FOR VARIABLE SWEEP WING IN FORWARD POSITION.	FEET
28-30	SPEEDS MH FOR VARIABLE SWEEP WING IN FORWARD POSITION.	MACH NUMBER
31	MINIMUM SPEED FLAPS UP (VSO) AT MDW.	KNOTS
32	MINIMUM SPEED FLAPS DOWN (VSL) AT LDW.	KNOTS
33	XO-DISTANCE FROM X REFERENCE POINT TO BODY NOSE.	INCHES
34	LN-LENGTH OF BODY NOSE.	INCHES

TABLE 3. BC INPUT DATA SET (CONT)

LOCATIONS	DESCRIPTIONS	
35	VN-BODY NOSE VOLUMN.	INCHES CUBED
36	RN=SQUARE ROOT (MAXIMUM NOSE AREA/PI)	INCHES
37	YBW-BODY HALF WIDTH AT WING-BODY INTERFACE.	INCHES
DATA LOCATIONS 38-57 ARE FOR A FIXED WING OR A VARIABLE SWEEP WING AFT POSITION.		
38	WING LEADING EDGE SWEEP ANGLE.	DEGREES
39	WING LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
40	WING APEX (X) STATION-LEADING EDGE AT CENTER LINE.	INCHES
41	WING APEX CHORD (CR)-ALONG CENTER LINE.	INCHES
42	WING TAPER RATIO-TIP CHORD/ROOT CHORD.	
43	WING ASPECT RATIO (AR)-SPAN SQUARED/AREA.	
44	WING TOTAL TRAPEZOIDAL AREA.	SQUARE FEET
45	WING SPAN-TIP TO TIP.	FEET
46-56	ELEVEN WING NORMAL SPAN (Y) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
57	PERCENT OF WING CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
58-68	ARE NOT USED. ENTER ZEROS.	
69-88	ARE NOT USED IF A/V HAS FIXED WING-ENTER ZEROS.	
DATA LOCATIONS 69-88 ARE FOR A VARIABLE SWEEP WING IN THE FORWARD POSITION.		
69	WING LEADING EDGE SWEEP ANGLE.	DEGREES
70	WING LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
71	WING APEX (X) STATION-LEADING EDGE AT CENTER LINE.	INCHES
72	WING APEX CHORD (CR)-ALONG CENTER LINE.	INCHES
73	WING TAPER RATIO-TIP CHORD/ROOT CHORD.	
74	WING ASPECT RATIO (AR)-SPAN SQUARED/AREA.	
75	WING TOTAL TRAPEZOIDAL AREA.	SQUARE FEET
76	WING SPAN-TIP TO TIP.	FEET
77-87	ELEVEN WING NORMAL SPAN (Y) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
88	PERCENT OF WING CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
89-99	ARE NOT USED-ENTER ZEROS.	
100	BUTT LINE (Y) OF FLAP-INBOARD END.	INCHES
101	-OUTBOARD END.	INCHES
102	FLAP CHORD/WING CHORD RATIO-AERODYNAMIC.	DECIMAL

TABLE 3. BC INPUT DATA SET (CONCL)

LOCATIONS	DESCRIPTIONS	
103	MAXIMUM FLAP DEFLECTION FOR FLAP MANEUVER.	DEGREES
104	Z DISTANCE FROM VERT TAIL ROOT TO HOR TAIL PLANE.	INCHES
105	HOR TAIL LEADING EDGE SWEEP ANGLE.	DEGREES
106	HOR TAIL LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
107	HOR TAIL APEX (X) STATION-LEADING EDGE AT HOR TAIL CEN LINE.	INCHES
108	HOR TAIL APEX CHORD (CR)-ALONG HOR TAIL CENTER LINE.	INCHES
109	HOR TAIL TAPER RATIO-TIP CHORD/ROOT CHORD.	
110	HOR TAIL ASPECT RATIO-SPAN SQUARED/AREA.	
111	HOR TAIL TOTAL TRAPEZOIDAL AREA.	SQUARE FEET
112	HOR TAIL SPAN-TIP TO TIP.	FEET
113	YBH-BODY HALF WIDTH AT HOR TAIL-BODY INTERFACE.	INCHES
114-124	ELEVEN HOR TAIL NORMAL SPAN (YH) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
125	PERCENT OF HOR TAIL CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
126-136	ARE NOT USED-ENTER ZEROS.	
137	VERT TAIL LEADING EDGE SWEEP ANGLE.	DEGREES
138	VERT TAIL LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
139	VERT TAIL APEX (X) STATION-LEADING EDGE AT VERT TAIL ROOT.	INCHES
140	VERT TAIL APEX CHORD (CR)-ALONG VERT TAIL ROOT.	INCHES
141	VERT TAIL TAPER RATIO-TIP CHORD/ROOT CHORD.	
142	VERT TAIL ASPECT RATIO-SPAN SQUARED/AREA.	
143	VERT TAIL TRAPEZOIDAL AREA-PER SURFACE IF DUAL.	SQUARE FEET
144	VERT TAIL SPAN-ROOT TO TIP.	FEET
145	Z DISTANCE FROM VERT TAIL ROOT TO VERT TAIL-BODY INTERFACE.	INCHES
146-156	ELEVEN VERT TAIL NORMAL SPAN (ZV) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
157	PERCENT OF VERT TAIL CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
158-165	ARE NOT USED-ENTER ZEROS	
166-168	SPEEDS ML-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	MACH NUMBER

TABLE 4. THE BF DATA REGION

LOCATIONS	DESCRIPTIONS	
BF(1) IS EQUIVALENT TO TCOM(4001).		
1-106	INPUT DATA FROM SWEEP	
1	SPEED MH AT 20000 FEET-FIXED WING OR VARIABLE SWEEP AFT.	MACH NUMBER
2	SPEED MH AT 20000 FEET-VARIABLE SWEEP WING FORWARD. ENTER ZERO IF A/V HAS FIXED WING.	MACH NUMBER
3-24	DATA FOR A FIXED WING OR A VARIABLE SWEEP WING IN AFT POSITION.	
3	WING ELASTIC AXIS SWEEP ANGLE.	DEGREES
4	(X) STATION OF ELASTIC AXIS AT CENTER LINE.	INCHES
5-14	TEN WING OUTER PANEL STRIP WEIGHTS-BODY INTERFACE TO TIP.	POUNDS
15-24	TEN WING OUTER PANEL STRIP CG (X/C) VALUES.	DECIMAL
25-46	DATA FOR A VARIABLE SWEEP WING IN FORWARD POSITION. ARE NOT USED IF A/V HAS FIXED WING-ENTER ZEROS.	
25	WING ELASTIC AXIS SWEEP ANGLE.	DEGREES
26	(X) STATION OF ELASTIC AXIS AT CENTER LINE.	INCHES
27-36	TEN WING OUTER PANEL STRIP WEIGHTS-BODY INTERFACE TO TIP.	POUNDS
37-46	TEN WING OUTER PANEL STRIP CG (X/C) VALUES.	DECIMAL
47-66	STATIONS (YEA) ALONG ELASTIC AXIS-20 MAXIMUM.	INCHES
67-86	VALUES OF EI AT (YEA) STATIONS-20 MAXIMUM.	POUND-INCHES SQUARED
87-106	VALUES OF GJ AT (YEA) STATIONS-20 MAXIMUM.	POUND-INCHES SQUARED
107-113	TEMPORARY STORAGE FOR SOME BC INPUT DATA TO BE REARRANGED.	
107	BUTT LINE (Y) OF FLAP-INBOARD END.	INCHES
108	-OUTBOARD END.	INCHES
109	FLAP CHORD/WING CHORD RATIO-AERODYNAMIC.	DECIMAL
110	MAXIMUM FLAP DEFLECTION FOR FLAP MANEUVER.	DEGREES

TABLE 4. THE BF DATA REGION (CONCL)

LOCATIONS	DESCRIPTIONS	
111-113	SPEEDS ML-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	MACH NUMBER
114-173	MODIFIED ARRAYS OF YEA,EI,AND GJ FOR INPUT TO SUBROUTINE WFLEX.	
114-133	TWENTY (YEA) STATIONS ALONG ELASTIC AXIS-ROOT TO TIP.	INCHES
134-153	VALUES OF EI FOR (YEA) STATIONS.	POUND-INCHES SQUARED
154-173	VALUES OF GJ FOR (YEA) STATIONS.	POUND-INCHES SQUARED
174	ELASTIC AXIS LENGTH FROM ROOT TO TIP.	INCHES
175	(YEA TIP - YEA BODY SIDE) / 15.0	INCHES
176-200	ARE NOT USED.	

TABLE 5. DT DATA SET

Location	Description
DT(1) is equivalent to TCØM (100)	
1 - 4	(1) through (4), span station, fraction of semispan
5 - 9	(1) through (4), taper ratios
9 - 20	M(1) through M(12), mach numbers
21 - 32	B/K (1) through B/K (12), compressible section lift-curve slope parameters
33 - 44	X/C_W (1) through X/C_W (12), wing section center of pressure locations, fraction of chord
45 - 56	X/C_T (1) through X/C_T (12), tail section center of pressure locations, fraction of chord

TABLE 6. DB DATA SET

Location	Description
DB(1) is equivalent to TØØM (156)	
1 - 6	$\Lambda_B(1)$ through $\Lambda_B(6)$, compressible sweep angle (deg)
7 - 13	BA/K(1) through BA/K(6), aspect ratio parameter
14 - 55	Table of $C_\ell C/C_L C_{AV}$ values versus Λ_B and BA/K for $\eta(1)$, $\lambda(1)$ (42 values per table)
56 - 97	Same as 14 - 55, except for $\eta(1)$, $\lambda(2)$
78 - 139	Same as 14 - 55, except for $\eta(1)$, $\lambda(3)$
140 - 181	Same as 14 - 55, except for $\eta(1)$, $\lambda(4)$
182 - 349	Same as 14 - 181, except $\eta = \eta(2)$
350 - 517	Same as 14 - 181, except $\eta = \eta(3)$
518 - 685	Same as 14 - 181, except $\eta = \eta(4)$
686 - 727	Table of $BC_{L\alpha}/K$ values versus Λ_B and BA/K for $\lambda(1)$ (42 values per table)
728 - 769	Same as 686 - 727, except $\lambda = \lambda(2)$
770 - 811	Same as 686 - 727, except $\lambda = \lambda(3)$
812 - 853	Same as 686 - 727, except $\lambda = \lambda(4)$
NOTES: Table data order = values for BA/K(1), $\Lambda_B(1)$ through $\Lambda_B(6)$ BA/K(2), $\Lambda_B(1)$ through $\Lambda_B(6)$, etc	

Refer to Table 2 in Volume III, Section II, for numerical values of data.

TABLE 7. DF DATA SET

Location	Description
DF(1) is equivalent to TOØM (1009)	
1 - 5	$C_F/C_W(1)$ through $C_F/C_W(5)$, flap chord to wing chord ratios
6 - 10	X/C (1) through X/C (5), centers of pressure of section lift due to flap deflection, fraction of wing chord
11 - 15	K_{CF} (1) through K_{CF} (5), flap lift effectiveness parameters
16 - 25	b_F/b_W (1) through b_F/b_W (10), flap span to wingspan ratios
26 - 36	η (1) through η(11) wingspan stations, fraction of wing semispan
37 - 146	Table of C_L $C/C_{L\alpha}$ C_{AV} values versus η, b_F/b_W
NOTE: Table data order = values for $b_F/b_W(1)$, η(1) through η(11) $b_F/b_W(2)$, η(1) through η(11), etc	

Refer to Table 3 in Volume III, Section II, for numberical value of data.

TABLE 8. DP DATA SET

Location	Description
DP(1) is equivalent to TØØM (1155)	
1 - 5	BA(1) through BA(5), aspect ratio parameter
6 - 14	Bm(1) through Bm(9), sweep parameter
15 - 59	Table of $2\Gamma/V\alpha b$ values versus Bm and BA for $\eta(1)$, $\lambda(1)$ (45 values per table)
60 - 104	Same as 15 - 59, except for $\eta(1)$, $\lambda(2)$
105 - 149	Same as 15 - 59, except for $\eta(1)$, $\lambda(3)$
150 - 194	Same as 15 - 59, except for $\eta(1)$, $\lambda(4)$
195 - 374	Same as 15 - 194, except $\eta = \eta(2)$
375 - 554	Same as 15 - 194, except $\eta = \eta(3)$
555 - 734	Same as 15 - 194, except $\eta = \eta(4)$
NOTE: Table data order = Values for BA(1), Bm(1) through Bm(9), etc	

Refer to Table 4 in Volume III, Section II, for numerical values of data.

TABLE 9. INTERNAL REARRANGED BC DATA SET

LOCATIONS	DESCRIPTIONS	
BC(1) IS	EQUIVALENT TO TCOM(2758)	
1	MAXIMUM DESIGN WEIGHT (MDW).	POUNDS
2	CENTER OF GRAVITY STATION (X) AT MDW-VARIABLE SWEEP WING FWD.	INCHES
3	CENTER OF GRAVITY STATION (X) AT MDW-VARIABLE SWEEP WING AFT. -FIXED WING.	INCHES
4	BASIC FLIGHT DESIGN WEIGHT (BFDW).	POUNDS
5	CENTER OF GRAVITY STATION (X) AT BFDW-VARIABLE SWEEP WING FWD.	INCHES
6	CENTER OF GRAVITY STATION (X) AT BFDW-VARIABLE SWEEP WING AFT. -FIXED WING.	INCHES
7	PITCHING MOMENT OF INERTIA (IYY) AT BFDW-VARIABLE SWEEP WING FORWARD.	SLUG-FT SQUARED
8	PITCHING MOMENT OF INERTIA (IYY) AT BFDW-VARIABLE SWEEP WING AFT. -FIXED WING.	SLUG-FT SQUARED
9	YAWING MOMENT OF INERTIA (IZZ) AT BFDW-VARIABLE SWEEP WING FORWARD.	SLUG-FT SQUARED
10	YAWING MOMENT OF INERTIA (IZZ) AT BFDW-VARIABLE SWEEP WING AFT. -FIXED WING.	SLUG-FT SQUARED
11	LANDING DESIGN WEIGHT (LDW).	POUNDS
12	CENTER OF GRAVITY STATION (X) AT LDW.	INCHES
13	LIMIT POSITIVE LOAD FACTOR (NZ) AT BFDW-SUBSONIC.	
14	LIMIT POSITIVE LOAD FACTOR (NZ) AT BFDW-SUPERSONIC.	
15	LIMIT NEGATIVE LOAD FACTOR (-NZ) AT BFDW-NEGATIVE SIGN (-) REQUIRED.	
16	LIMIT LOAD FACTOR (NZ) FOR FLAP DOWN MANEUVER AT MDW.	
17	PITCHING ACCELERATION AT ML FOR BFDW.	RAD./SECOND SQUARED
18	YAWING ACCELERATION AT ML FOR BFDW.	RAD./SECOND SQUARED
19-21	ALTITUDES-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	FEET
22-24	SPEEDS MH-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	MACH NUMBER
25-27	SPEEDS ML-FIXED WING OR VARIABLE SWEEP IN AFT POSITION.	MACH NUMBER
28	SPEED MH AT 20000 FT-VARIABLE SWEEP WING IN THE AFT POSITION. -AND FOR A FIXED WING.	MACH NUMBER
29-33	ARE NOT USED IF A/V HAS FIXED WING.	
29-30	ALTITUDES FOR VARIABLE SWEEP WING IN FORWARD POSITION.	FEET
31-32	SPEEDS MH FOR VARIABLE SWEEP WING IN FORWARD POSITION.	MACH NUMBER

TABLE 9. INTERNAL REARRANGED BC DATA SET (CONT)

LOCATIONS	DESCRIPTIONS	
33	SPEED MH AT 20000 FT-VARIABLE SWEEP WING FORWARD POSITION.	MACH NUMBER
34	MINIMUM SPEED FLAPS UP (VSO) AT MDW.	KNOTS
35	MINIMUM SPEED FLAPS DOWN (VSL) AT LDW.	KNOTS
36	XO-DISTANCE FROM X REFERENCE POINT TO BODY NOSE.	INCHES
37	LN-LENGTH OF BODY NOSE.	INCHES
38	VN-BODY NOSE VOLUMN.	INCHES CUBED
39	RN=SQUARE ROOT (MAXIMUM NOSE AREA/PI)	INCHES
40	YBW-BODY HALF WIDTH AT WING-BODY INTERFACE.	INCHES
41	BUTT LINE (Y) OF FLAP-INBOARD END.	INCHES
42	-OUTBOARD END.	INCHES
43	FLAP CHORD/WING CHORD RATIO-AERODYNAMIC.	DECIMAL
44	MAXIMUM FLAP DEFLECTION FOR FLAP MANEUVER.	DEGREES
DATA LOCATIONS 45-86 ARE FOR A FIXED WING OR A VARIABLE SWEEP WING AFT POSITION.		
45	WING LEADING EDGE SWEEP ANGLE.	DEGREES
46	WING ELASTIC AXIS SWEEP ANGLE.	DEGREES
47	WING LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
48	WING APEX (X) STATION-LEADING EDGE AT CENTER LINE.	INCHES
49	WING ELASTIC AXIS (X) STATION AT CENTER LINE.	INCHES
50	WING APEX CHORD (CR)-ALONG CENTER LINE.	INCHES
51	WING TAPER RATIO-TIP CHORD/ROOT CHORD.	
52	WING ASPECT RATIO (AR)-SPAN SQUARED/AREA.	
53	WING TOTAL TRAPEZOIDAL AREA.	SQUARE FEET
54	WING SPAN-TIP TO TIP.	FEET
55	PERCENT OF WING CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
56-66	ELEVEN WING NORMAL SPAN (Y) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
67-76	TEN WING OUTER PANEL STRIP WEIGHTS-BODY INTERFACE TO TIP.	POUNDS
77-86	TEN WING OUTER PANEL STRIP CG (X/C) VALUES.	DECIMAL
87-128	ARE NOT USED IF A/V HAS FIXED WING-ENTER ZEROS.	
DATA LOCATIONS 87-128 ARE FOR A VARIABLE SWEEP WING IN THE FORWARD POSITION.		
87	WING LEADING EDGE SWEEP ANGLE.	DEGREES
88	WING ELASTIC AXIS SWEEP ANGLE.	DEGREES
89	WING LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES

TABLE 9. INTERNAL REARRANGED BC DATA SET (CONT)

LOCATIONS	DESCRIPTIONS	
90	WING APEX (X) STATION-LEADING EDGE AT CENTER LINE.	INCHES
91	WING ELASTIC AXIS (X) STATION AT CENTER LINE.	INCHES
92	WING APEX CHORD (CR)-ALONG CENTER LINE.	INCHES
93	WING TAPER RATIO-TIP CHORD/ROOT CHORD.	
94	WING ASPECT RATIO (AR)-SPAN SQUARED/AREA.	
95	WING TOTAL TRAPEZOIDAL AREA.	SQUARE FEET
96	WING SPAN-TIP TO TIP.	FEET
97	PERCENT OF WING CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
98-108	ELEVEN WING NORMAL SPAN (Y) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
109-118	TEN WING OUTER PANEL STRIP WEIGHTS-BODY INTERFACE TO TIP.	POUNDS
119-128	TEN WING OUTER PANEL STRIP CG (X/C) VALUES.	DECIMAL
129	HOR TAIL LEADING EDGE SWEEP ANGLE.	DEGREES
130	HOR TAIL LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
131	HOR TAIL APEX (X) STATION-LEADING EDGE AT HOR TAIL CEN LINE.	INCHES
132	HOR TAIL APEX CHORD (CR)-ALONG HOR TAIL CENTER LINE.	INCHES
133	HOR TAIL TAPER RATIO-TIP CHORD/ROOT CHORD.	
134	HOR TAIL ASPECT RATIO-SPAN SQUARED/AREA.	
135	HOR TAIL TOTAL TRAPEZOIDAL AREA.	SQUARE FEET
136	HOR TAIL SPAN-TIP TO TIP.	FEET
137	YBH-BODY HALF WIDTH AT HOR TAIL-BODY INTERFACE.	INCHES
138	PERCENT OF HOR TAIL CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
139-149	ELEVEN HOR TAIL NORMAL SPAN (YH) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
150	VERT TAIL LEADING EDGE SWEEP ANGLE.	DEGREES
151	VERT TAIL LOADS REFERENCE AXIS SWEEP ANGLE.	DEGREES
152	VERT TAIL APEX (X) STATION-LEADING EDGE AT VERT TAIL ROOT.	INCHES
153	VERT TAIL APEX CHORD (CR)-ALONG VERT TAIL ROOT.	INCHES
154	VERT TAIL TAPER RATIO-TIP CHORD/ROOT CHORD.	
155	VERT TAIL ASPECT RATIO-SPAN SQUARED/AREA.	
156	VERT TAIL TRAPEZOIDAL AREA-PER SURFACE IF DUAL.	SQUARE FEET
157	VERT TAIL SPAN-ROOT TO TIP.	FEET
158	Z DISTANCE FROM VERT TAIL ROOT TO VERT TAIL-BODY INTERFACE.	INCHES

TABLE 9. INTERNAL REARRANGED BC DATA SET (CONCL)

LOCATIONS	DESCRIPTIONS	
159	Z DISTANCE FROM VERT TAIL ROOT TO HOR TAIL PLANE.	INCHES
160	PERCENT OF VERT TAIL CHORD OF LOADS REFERENCE AXIS (X/C).	DECIMAL
161-171	ELEVEN VERT TAIL NORMAL SPAN (ZV) STATIONS FOR WEIGHT ANALYSIS. FROM ROOT TO TIP.	INCHES
172-195	ARE NOT USED.	

TABLE 10. TØØM BLOCKED CORE LOCATIONS

Data Block	Core Location		Data are Described in:	
	Data	TØØM Equivalence	Table No.	Page No.
---	Not used	TØØM(1) through TØØM(99)	---	---
DT	DT(1) through DT(56)	TØØM(100) through TØØM(155)	5	93
DB	DB(1) through DB(853)	TØØM(156) through TØØM(1008)	6	94
DF	DF(1) through DF(146)	TØØM(1009) through TØØM(1154)	7	95
DP	DP(1) through DP(734)	TØØM(1155) through TØØM(1888)	8	96
---	Not used	TØØM(1889) through TØØM(2757)	---	---
BC	BC(1) through BC(195)	TØØM(2758) through TØØM(2952)	9	97-100
BB	BB(1) through BB(20)	TØØM(2953) through TØØM(2972)	11	102
BS	BS(1) through BS(20)	TØØM(2973) through TØØM(2992)	12	103-104
BD	BD(1) through BD(160)	TØØM(2993) through TØØM(3152)	13	105-107
BU	BU(1) through BU(500)	TØØM(3153) through TØØM(3652)	14	108-111
BØ	BØ(1) through BØ(348)	TØØM(3653) through TØØM(4000)	15	112-114
BF	BF(1) through BF(200)	TØØM(4001) through TØØM(4200)	4	91-92
ND	ND(1) through ND(200)	TØØM(4201) through TØØM(4400)	16	115-117

TABLE 11. CONDITION DATA REGION BB***

Location	Description
BB(1) is equivalent to TCØM(2953)	
1	W, airplane weight (lb)
2	XCG, airplane center of gravity location (FS) (in.)
3	I_Y, airplane pitching moment of inertia (slug ft^2)
4	I_Z, airplane yawing moment of inertia (slug ft^2)
5	δ_F, flap deflection (deg)
6	N_Z, airplane limit normal load factor
7	$\dot{Q}$, airplane pitching acceleration (rad/sec^2)
8	$\dot{R}$, airplane yawing acceleration (rad/sec^2)
9	hp, altitude (ft)
10	M, mach number
11	Previous condition altitude (ft)
12	Wing ID number*
13	Horizontal ID number = 4.0
14	Vertical tail ID number**
15	Condition number
16	Previous condition mach number
17	q, dynamic pressure (psf)
18	$C_{L\alpha WR}$, wing rigid lift curve slope per radian
19	V_E, equivalent airspeed (knots)
20	Balance N_Z, airplane normal load factor for balanced part

*Fixed wing ID = 1.0
Variable wing forward ID = 2.0
Variable wing aft ID = 3.0

**Single vertical tail ID = 5.0
Dual vertical tail ID = 6.0
T-type vertical tail ID = 7.0

***This condition data region is set up for each condition by the main program BFCNTL.

TABLE 12. PARAMETER DATA REGION BS FOR SUBROUTINES USPANF AND BNLDSF

Location	Description
	USPANF
BS(1) is equivalent to TCØM(2973)	
1	B/K, subsonic lift-curve slope parameter
2	M, mach number
3	$(X/C)_{CP}$, section center of pressure, fraction of chord
4	Y_{BS}, wing-body interface station (BL), or horizontal
5	Λ_{LE}, surface leading edge sweep angle (deg)
6	Λ_{EA}, surface elastic axis sweep angle (deg)
7	Λ_{RA}, surface load reference line sweep angle (deg)
8	X_{LE}, fuselage sta. of root chord leading edge (in.)
9	X_{EA}, fuselage sta of elastic axis at root chord (in.)
10	C_R, root chord of theoretical surface (in.)
11	λ_S, taper ratio of theoretical surface
12	A_S, aspect ratio of theoretical surface
13	S_S, area of theoretical surface (ft^2)
14	$b_S/2$ or b_V, span of surface panel (in.)
15	η_{BS} or η_{BV}, span station of surface-body interface station, fraction of panel span
16	$(X/C)_{RA}$, location of load reference line in fraction of chord
17	$Y_{FO}/b_W/2$, wingspan station of outboard end of flap, fraction of semispan
18	$Y_{FI}/b_W/2$, wingspan station of inboard end of flap, fraction of semispan
19	Λ_B, subsonic compressible sweep parameter, or BA, supersonic aspect ratio parameter
20	BA/K, subsonic aspect ratio parameter, or Bm, supersonic sweep parameter

TABLE 12. PARAMETER DATA REGION BS FOR SUBROUTINES USPANF AND BNLDSF (CONCL)

Location	Description
	BNLDSF
BS(1) is equivalent to TØØM(2973)	
1	S_S, area of theoretical surface (ft^2)
2	X_{LE}, fuselage station of root chord leading edge (in.)
3	b_S, span of surface (ft)
4	PZN/PZW1, ratio of fuselage nose normal load to wing normal load due to angle of attack
5	A, balance equation factor
6	B, balance equation factor
7	C, balance equation factor
8	D, balance equation factor
9	E, balance equation factor
10	F, balance equation factor
11	WØP, exposed wing panel weight per side (lb)
12	K_{CF}, flap lift effectiveness parameter
13	PZW1, wing flexible normal airload due to angle of attack (lb)
14	PZW2, wing rigid normal airload due to flap deflection (lb)
15	PZW3, wing increment flexible normal airload due to flap deflection (lb)
16	PZW4, wing flexible normal airload due to vertical acceleration (lb)
17	PZH, horizontal tailload (lb)
18	μ, airplane mass ratio
19	K_g, gust alleviation factor
20	ΔPZHQ, incremental horizontal tailload due to pitching acceleration (lb)

TABLE 13. THE BD DATA REGION

Location	Description
BD(1) is equivalent to TCØM(2993)	
1-4	Array (YA) - subsonic ($BC_{L\alpha}/K$) table values
5-20	Array (YB) - rigid loading table values (first)
5-20	Array (YB) - loading at weight analysis stations (second)
21-25	Array (YC) - rigid loading values at aero data stations
26-30	Array (ED) - aero data stations fraction of span
31-43	Array (ESS) - strip boundary stations (first) fraction of span
31-43	Array (ESS) - weight analysis stations (second) fraction of span
44	No. of wing outer panel weight strips per side
45-57	Array (YSS) - strip running loadings (first)
45-57	Array (YSS) - torsional loading at weight analysis station (second)
58-68	Array (DPA) - strip alpha loads
69	Flap lift center of pressure, fraction of wing chord (X/C)
70-80	Array (DPF) - flap effects strip loads
81-88	Subroutine FCØDM2 factors
81-84	Array (T)
85-88	Array (YX)
89	PWØ - summated strip alpha loads to centerline (first)
89	Summated AFW (I,1) - exposed rigid alpha loads (second)

TABLE 13. THE BD DATA REGION (CONT)

Location	Description
90	P_{W1} - $P_{W\emptyset}$ less half carry-over strip load (first)
90	Summated AFWF (I,1) - exposed flexible alpha loads (second)
91	Summated wing outer panel weights (first) (lb)
91	Ratio of exposed alpha load to total (second) (dec) = 1.0
92	Atmospheric density (Rho) (slugs/feet cubed)
93	Factor (NB-I) - number of strips counter
94	Speed of Sound (ah) (knots)
95-105	Array (ECP) - strip center of pressure, fraction of span
106-116	Array (ULN) - running load at weight analysis stations
117-129	Array (DXS) - swept torsion arms (in.)
130-140	Array (UTN) - torsional loading at weight analysis station (in.)
141	Parameter K sweep
142	Fraction of swept chord of reference axis, X/C
143	Fraction of swept chord of center of pressure, X/C
144	Swept chord (in.)
145	Expression: 1.0-Ks (1.0-(X/C) of RA-(X/C)s of RA)
146	Integral of Array (ULN) versus (Y/b/2) - tip to root
147	KUZ, span-loading normalizing parameter
148	Swept bending moment at body side (in./lb)
149	Swept torsion moment at body side (in./lb)

TABLE 13. THE BD DATA REGION (CONCL)

Location	Description
150	Empennage swept torsion arm at body interface (in.)
151	Body nose load due to vertical gust (lb)
152	Exposed wingload due to vertical gust (lb)
153	Body carry-over load due to vertical gust (lb)
154	Horizontal tailload due to vertical gust (lb)
155	Parameter KPA
156	Wing semispan (first) (in.)
156	Horizontal tail semispan (second) (in.)
156	Vertical tail span (third) (in.)
157	Wing reference axis sweep angle (first) (deg)
157	Horizontal tail reference axis sweep angle (second) (deg)
157	Vertical tail reference axis sweep angle (third) (deg)
158	Swept distance from vertical tail root to horizontal tail plane (in.)
159	Gust load factor
160	Wing inertial aeroelastic load due to vertical gust (lb)

TABLE 14. THE BU DATA REGION

Location	Description
BU(1) is equivalent to T[illegible]M (3153)	
1-60	Data for wing flexible alpha effects
1	Flexible lift curve slope
2	X-distance from apex to total load CP (in.)
3	Y-distance from CL to exposed load CP (in.)
4	X-distance from apex to exposed load CP (in.)
5	X-distance from apex to carry-over load CP (in.)
6	Airload unit shear at side of body (dec)
7	Airload unit bending moment at side of body (in.)
8	Airload unit torsion moment at side of body (in.)
9-21	13 load stations, percent span from tip to ℄ (dec)
22-34	Airload unit shears from tip to centerline (dec)
35-47	Airload unit bending moments - swept (in.)
48-60	Airload unit torsion moments - swept (in.)
61-107	Data for wing rigid flap effects
61	Parameter KBF
62	X-distance from apex to total load CP (in.)
63	Y-distance from CL to exposed load CP (in.)
64	X-distance from apex to exposed load CP (in.)
65	X-distance from apex to carry-over load CP (in.)
66	Airload unit shear at side of body (dec)
67	Airload unit bending moment at side of body (in.)

TABLE 14. THE BU DATA REGION (CONT)

Location	Description
68	Airload unit torsion moment at side of body (in.)
69-81	Airload unit shears from tip to centerline (dec)
82-94	Airload unit bending moments - swept (in.)
95-107	Airload unit torsion moments - swept (in.)
108-166	<u>Data for horizontal tail effects</u>
108	Horizontal tail lift curve slope
109	Parameter KH(B)
110	YH distance from centerline to horizontal tailload CP (in.)
111	XH distance from HT apex to HT load CP (in.)
112	Airload unit shear at side of body (dec)
113	Airload unit bending moment at side of body (in.)
114	Airload unit torsion moment at side of body (in.)
115-127	Thirteen HT load stations - percent spantip to centerline (dec)
128-140	Airload unit shears from tip to centerline (dec)
141-153	Airload unit bending moments - swept (in.)
154-166	Airload unit torsion moments - swept (in.)
167-225	<u>Data for vertical tail effects</u>
167	Vertical tail lift curve slope
168	Parameter KV(B)
169	Z-distance from VT root to vertical tailload CP (in.)

TABLE 14. THE BU DATA REGION (CONT)

Location	Description
170	XV distance from VT apex to vertical tailload CP (in.)
171	Airload unit side shear at body interface (dec)
172	Airload unit bending moment at body interface (in.)
173	Airload unit torsion moment at body interface (in.)
174-186	Thirteen VT load stations - percent spantip to root (dec)
187-199	Airload unit side shears from tip to root (dec)
200-212	Airload unit bending moments - swept (in.)
213-225	Airload unit torsion moments - swept (in.)
226-357	Data arrays for subroutine WFLEX
226-255	Rigid load matrix - AFW(10,3) (lb)
256-285	Rigid load CP(X/C) matrix - AFWCP (10,3) (dec)
286-315	Flexible load matrix - AFWF(10,3) (lb)
316-345	Aeroelastic increment load matrix - AFWDF(10,3) (lb)
346-357	Unit loads and F/R matrix - F(3,4) (dec)
358-403	Data for aeroelastic flap effects
358	X-distance from apex to total load CP (in.)
359	Y-distance from centerline to exposed load CP (in.)
360	X-distance from apex to exposed load CP (in.)
361	X-distance from apex to carry-over load CP (in.)
362	Airload unit shear at side of body (dec)
363	Airload unit bending moment at side of body (in.)
364	Airload unit torsion moment at side of body (in.)

TABLE 14. THE BU DATA REGION (CONCL)

Location	Description
365-377	Airload unit shears from tip to centerline (dec)
378-390	Airload unit bending moments - swept (in.)
391-403	Airload unit torsion moments - swept (in.)
404-449	Data for inertial aeroelastic effects
404	X-distance from apex to total load CP (in.)
405	Y-distance from centerline to exposed load CP (in.)
406	X-distance from apex to exposed load CP (in.)
407	X-distance from apex to carry-over load CP (in.)
408	Airload unit shear at side of body (dec)
409	Airload unit bending at side of body (in.)
410	Airload unit torsion at side of body (in.)
411-423	Airload unit shears from tip to centerline (dec)
424-436	Airload unit bending moments - swept (in.)
437-449	Airload unit torsion moments - swept (in.)
450-454	Data for subroutine SPABMF
450	Wing total flexible alpha airload (PZW1) (lb)
451	Wing total rigid flap airload (PZW2) (lb)
452	Wing total aeroelastic flap airload (PZW3) (lb)
453	Wing total inertia aeroelastic airload (PZW4) (lb)
455-494	Previously inputed EI and GJ arrays
495-500	Are not used

TABLE 15. OUTPUT BØ DATA REGION

Location	Description
BØ(1) through BØ(180) is equivalent to TCØM(3653) through TCØM(3832)	
1	Condition number
2	Fuselage ID number
3	P_{ZN}, body nose normal load (lb)
4	P_{YN}, body nose side load (lb)
5	$\overline{X}_N$, body nose CP (fus sta) (in.)
6	$P_{ZW(B)}/2$, exposed wing panel load (per side) (lb)
7	$\overline{Y}_{W(B)}$, spanwise CP of exposed wing panel load (BL) (in.)
8	$\overline{X}_{W(B)}$, exposed wing panel CP (fus sta) (in.)
9	$P_{ZB(W)}$, body carry-over load (lb)
10	$\overline{X}_{B(W)}$, body carry-over CP (fus sta) (in.)
11	$P_{ZHT}/2$, horizontal tail panel load (per side) (lb)
12	$\overline{Y}_{HT}$, spanwise CP of horizontal tail panel load (BL) (in.)
13	$\overline{X}_{HT}$, horizontal tailload CP (fus sta) (in.)
14	$M_{XV(H)}$, incremental unsymmetrical horizontal tail rolling moment (for T-tail and fus) (in./lb)
15	P_{YVT}, vertical tail side load
16	$\overline{Z}_{VT}$, vertical tail spanwise CP (WL) (in.)
17	$\overline{X}_{VT}$, vertical tail CP (fus sta) (in.)
18	N_Z, airplane normal load factor
19	N_Y, airplane side load factor
20	$\dot{Q}$, airplane pitching acceleration (rad/sec^2)

TABLE 15. OUTPUT BØ DATA REGION (CONT)

Location	Description
21	$\dot{R}$, airplane yawing acceleration (rad/sec^2)
22	Wing ID number
23	Y_{BW}, wing-body interface station (BL) (in.)
24	S_{ZBW}, wing shear load at side of body station (lb)
25	M_{XBW}, exposed wing panel rolling moment at side of body station (in./lb)
26	M_{YBW}, exposed wing panel pitching moment at intersection of load reference line and side of body station (in./lb)
Wing shears and moments at stations $Y_{W\Lambda}$ (1) through $Y_{W\Lambda}$(12) along load reference line:	
27	$Y_{W\Lambda}$ (1), first wing station (in.)
28	S_{ZW}(1), shear at station $Y_{W\Lambda}$(1) (lb)
29	$M_{X\Lambda}$(1), bending moment at station $Y_{W\Lambda}$(1) (in./lb)
30	$M_{Y\Lambda}$(1), torsional moment at station $Y_{W\Lambda}$(1) (in./lb)
31 - 74	Station, shear, and moments in same order as 27 through 30, for next 11 wing stations
75	Horizontal tail ID number
76	Y_{BH}, horizontal tail-body interface station (BL) (in.)
77	S_{ZBH}, horizontal tail shear at side of body station (lb)
78	M_{XBH}, exposed horizontal tail panel rolling moment at side of body station (in./lb)
79	M_{YBH}, exposed horizontal tail panel pitching moment at intersection of load reference line and side of body station (in./lb)

TABLE 15. OUTPUT BØ DATA REGION (CONCL)

Location	Description
Horizontal tail shears and moments at stations $Y_{H\Lambda}(1)$ through $Y_{H\Lambda}(12)$ along load reference line:.	
80	$Y_{H\Lambda}(1)$, first horizontal tail station (in.)
81	S_{ZH}, shear at station $Y_{H\Lambda}(1)$ (lb)
82	$M_{X\Lambda}$, bending moment at station $Y_{H\Lambda}(1)$ (in./lb)
83	$M_{Y\Lambda}$, torsional moment at station $Y_{H\Lambda}(1)$ (in./lb)
84 - 127	Station, shear, and moments in same order as 80 through 81, for next 11 horizontal tail stations
128	Vertical tail ID number
129	Z_{BV}, vertical distance from vertical tail root chord station to vertical tail-body interface station (in.)
130	S_{YBV}, vertical tail shear at vertical tail-body interface station (lb)
131	M_{XBV}, exposed vertical tail panel rolling moment at vertical tail-body interface station (in./lb)
132	M_{ZBV}, exposed vertical tail panel yawing moment at the intersection of the load reference line and the vertical tail-body interface station (in./lb)
Vertical tail shears and moments at stations $Z_{V\Lambda}(1)$ through $Z_{V\Lambda}(12)$ along load reference line	
133	$Z_{V\Lambda}(1)$, first vertical tail station (in.)
134	S_Z (1), shear at station Z_V (1) (lb)
135	$M_{X\Lambda}(1)$, bending moment at station $Z_{V\Lambda}(1)$ (in./lb)
136	$M_{Z\Lambda}(1)$, torsional moment at station $Z_{V\Lambda}(1)$ (in./lb)
137 - 180	Station, shear, and moments in same order as 133 through 136, for next 11 vertical tail stations

TABLE 16. INTEGER DATA REGION (ND)

Location	Description
ND(1) is equivalent to TCOM(4201)	
1-12	Integers
13-46	Control factors (refer to Table 1)
47-99	Are not used
100	BFCNTL - Case number counter (NC)
101	Integer Variable (I)
102	Integer Variable (J)
103	USPANF - NΦEIGJ = 20
103	BFCNTL - Punched card index number col 2-12 (IC)
104	Punched card ID number col 73-80 (IDC)
105	BFCNTL, USPANF - SIC matrix calculation option (IACALCS)
106	BFCNTL, BNLDSF - Condition type factor (NI)
107	BFCNTL, RERDAT, USPANF - RERDAT entry factor (IR)
108	BFCNTL, USPANF - (NF = -1)
109-131	BFCNTL - Condition selection array (No = -1, Yes = 1)
132	RERDAT, USPANF - Integer variable (I)
133	Integer variable (J)
134	USPANF - Integer variable (K)
135	Integer variable (L)
136	Integer variable (M)
137	USPANF, RERDAT, BNLDSF, SPABMF - Wing position factor (IP) (Refer to note)

TABLE 16. INTEGER DATA REGION (ND) (CONT)

Location	Description
138	FCØDM2 - Interpolation factor (N3)
139	Interpolation factor (N4)
140	Integer variable (I)
141	Integer variable (K)
142	Integer variable (L)
143	CØDIM2 - Interpolation factor (N1)
144	Integer variable (J)
145	Integer variable (JJ)
146	Integer variable (K)
147	Integer variable (L)
148	Integer variable (M)
149	USPANF - Repeatative operation counter (NT)
150	BNLDSF - Repeatative operation counter (NT)
151	Integer variable (I)
152	Integer variable (J)
153	Integer variable (K)
154	SPABMF - Distribution selector (ID)
155	Integer variable (I)
156	Integer variable (J)
157	Integer variable (K)

TABLE 16. INTEGER DATA REGION (ND) (CONCL)

Location	Description
158	Integer variable (L)
159	Integer variable (M)
160-200	Not used

NOTE: (-1) = fixed, (0) = VS wing fwd, (1) = VS wing aft

TABLE 17. LISTING OF CONDITION PUNCHED OUTPUT COMPONENT LIMIT AIRLOADS DATA FOR SWEEP

1	6.03150E 04	6.03000E 03	1.35195E 03	2.51056E 03	7.99106E 01	10603001
6	1.19952E 04	9.66348E 01	3.53530E 02	4.50491E 03	2.76666E 02	10603002
11	-1.32359E 03	4.97644E 01	4.99432E 02	1.97602E 04	1.31553E 04	10603003
16	5.62251E 01	5.01705E 02	1.00000E 00	5.75951E-01	0.0	10603004
21	-1.84769E 00	6.03100E 03	3.35000E 01	1.19952E 04	7.59712E 05	10603005
26	-9.86198E 05	3.12810E 02	0.0	0.0	0.0	10603006
31	2.90517E 02	1.41979E 02	1.58255E 03	-1.25360E 03	2.68222E 02	10603007
36	5.28498E 02	9.05667E 03	-4.98466E 03	2.45926E 02	1.09545E 03	10603008
41	2.71602E 04	-1.11774E 04	2.23631E 02	1.81895E 03	5.96493E 04	10603009
46	-2.00877E 04	2.01335E 02	2.71062E 03	1.10144E 05	-3.23895E 04	10603010
51	1.79040E 02	3.76775E 03	1.82363E 05	-4.84892E 04	1.56744E 02	10603011
56	4.96191E 03	2.79679E 05	-6.83463E 04	1.34449E 02	6.27109E 03	10603012
61	4.04902E 05	-9.19881E 04	1.12153E 02	7.67537E 03	5.60374E 05	10603013
66	-1.19361E 05	8.96577E 01	9.15146E 03	7.47955E 05	-1.50260E 05	10603014
71	6.75622E 01	1.06841E 04	9.69078E 05	-1.84523E 05	6.03400E 03	10603015
76	2.60000E 01	-1.01266E 03	-3.82321E 04	3.75607E 04	1.51761E 02	10603016
81	0.0	0.0	0.0	1.42160E 02	-2.39596E 01	10603017
86	-1.15262E 02	2.39698E 01	1.32430E 02	-8.49236E 01	-6.44955E 02	10603018
91	8.97107E 01	1.22701E 02	-1.63484E 02	-1.85341E 03	1.83874E 02	10603019
96	1.12971E 02	-2.50995E 02	-3.86976E 03	2.99969E 02	1.03242E 02	10603020
101	-3.45271E 02	-6.77046E 03	4.37148E 02	9.35121E 01	-4.42818E 02	10603021
106	-1.06044E 04	5.91534E 02	8.37825E 01	-5.40487E 02	-1.53879E 04	10603022
111	7.58705E 02	7.40529E 01	-6.37482E 02	-2.11185E 04	9.37256E 02	10603023
116	6.43233E 01	-7.33545E 02	-2.77883E 04	1.12651E 03	5.45937E 01	10603024
121	-8.28535E 02	-3.53874E 04	1.32593E 03	4.48642E 01	-9.22137E 02	10603025
126	-4.39041E 04	1.53453E 03	6.03500E 03	2.15500E 01	1.08541E 04	10603026
131	5.00967E 05	-4.83068E 05	1.69513E 02	0.0	0.0	10603027
136	0.0	1.57840E 02	2.73391E 02	1.59565E 03	-3.20031E 02	10603028
141	1.46113E 02	9.45717E 02	8.74359E 03	-1.18194E 03	1.34387E 02	10603029
146	1.79495E 03	2.48129E 04	-2.42102E 03	1.22660E 02	2.74101E 03	10603030
151	5.14084E 04	-3.97791E 03	1.10933E 02	3.75287E 03	8.94836E 04	10603031
156	-5.83148E 03	9.92069E 01	4.78932E 03	1.39569E 05	-7.92323E 03	10603032
161	8.74804E 01	5.82532E 03	2.01805E 05	-1.02088E 04	7.57539E 01	10603033
166	6.85568E 03	2.76157E 05	-1.26758E 04	6.40273E 01	7.87850E 03	10603034
171	3.62547E 05	-1.53173E 04	5.23008E 01	8.89077E 03	4.60670E 05	10603035
176	-1.81220E 04	4.05743E 01	9.88735E 03	5.70971E 05	-2.10706E 04	10603036

TABLE 18. CONDITION ARRAY ID (CN)

```
ARRAY NO.                         DESCRIPTIONS

   01    POSITIVE VERTICAL GUST. (NOT COMPUTED AT ALTITUDES ABOVE 20000 FT)
              CASE 4 = MH(1,1) AT ALT(1,1)
              CASE 5 = MH(1,2) AT ALT(1,2) OR MH(1,20) AT 20000 FT
              CASE 6 = MH(1,3) AT ALT(1,3) OR MH(1,20) AT 20000 FT
   02    NEGATIVE VERTICAL GUST. (NOT COMPUTED AT ALTITUDES ABOVE 20000 FT)
              CASE 4 = MH(1,1) AT ALT(1,1)
              CASE 5 = MH(1,2) AT ALT(1,2) OR MH(1,20) AT 20000 FT
              CASE 6 = MH(1,3) AT ALT(1,3) OR MH(1,20) AT 20000 FT
   03    LATERAL GUST. (NOT COMPUTED AT ALTITUDES ABOVE 20000 FT)
              CASE 4 = MH(1,1) AT ALT(1,1)
              CASE 5 = MH(1,2) AT ALT(1,2) OR MH(1,20) AT 20000 FT
              CASE 6 = MH(1,3) AT ALT(1,3) OR MH(1,20) AT 20000 FT
   04    POSITIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(1,1)
              CASE 1 = ML(1,1)
              CASE 7 MN=.90
   05    NEGATIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(1,1)
              CASE 4 = MH(1,1)
              CASE 7 MN=.90
   06    PITCHING ACCELERATION AT ALT(1,1)
              CASE 1 = ML(1,1)
              CASE 7 MN=.90
   07    YAWING ACCELERATION AT ALT(1,1)
              CASE 1 = ML(1,1)
              CASE 7 MN=.90
   08    POSITIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(1,2)
              CASE 1 = ML(1,1)
              CASE 2 = ML(1,2)
              CASE 7 MN=.90
   09    NEGATIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(1,2)
              CASE 4 = MH(1,1)
              CASE 5 = MH(1,2)
              CASE 7 MN=.90
```

TABLE 18. CONDITION ARRAY ID (CN) (CONT)

ARRAY NO.	DESCRIPTIONS
10	PITCHING ACCELERATION AT ALT(1,2)
	CASE 1 = ML(1,1)
	CASE 2 = ML(1,2)
	CASE 7 MN=.90
11	YAWING ACCELERATION AT ALT(1,2)
	CASE 1 = ML(1,1)
	CASE 2 = ML(1,2)
	CASE 7 MN=.90
12	POSITIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(1,3)
	CASE 1 = ML(1,1)
	CASE 2 = ML(1,2)
	CASE 3 = ML(1,3)
	CASE 7 MN=.90
13	NEGATIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(1,3)
	CASE 4 = MH(1,1)
	CASE 5 = MH(1,2)
	CASE 6 = MH(1,3)
	CASE 7 MN=.90
14	PITCHING ACCELERATION AT ALT(1,3)
	CASE 1 = ML(1,1)
	CASE 2 = ML(1,2)
	CASE 3 = ML(1,3)
	CASE 7 MN=.90
15	YAWING ACCELERATION AT ALT(1,3)
	CASE 1 = ML(1,1)
	CASE 2 = ML(1,2)
	CASE 3 = ML(1,3)
	CASE 7 MN=.90
16	MANEUVERING FLAP AT SEA LEVEL FOR 1.5VSO
17	1 G TRIMMED FLAP AT SEA LEVEL FOR 1.2VSL
18	POSITIVE VERTICAL GUST. (NOT COMPUTED AT ALTITUDES ABOVE 20000 FT)
	CASE 10 = MH(2,1) AT ALT(2,1)
	CASE 11 = MH(2,2) AT ALT(2,2) OR MH(2,20) AT 20000 FT

TABLE 18. CONDITION ARRAY ID (CN) (CONCL)

ARRAY NO.	DESCRIPTIONS
19	NEGATIVE VERTICAL GUST. (NOT COMPUTED AT ALTITUDES ABOVE 20000 FT) CASE 10 = MH(2,1) AT ALT(2,1) CASE 11 = MH(2,2) AT ALT(2,2) OR MH(2,20) AT 20000 FT
20	POSITIVE LOAD FACTOR BALANCED FLIGHT MANEUVER CASE 10 = MH(2,1) ALT(2,1)
21	NEGATIVE LOAD FACTOR BALANCED FLIGHT MANEUVER CASE 10 = MH(2,1) ALT(2,1)
22	POSITIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(2,2) CASE 10 = MH(2,1) CASE 11 = MH(2,2)
23	NEGATIVE LOAD FACTOR BALANCED FLIGHT MANEUVER AT ALT(2,2) CASE 10 = MH(2,1) CASE 11 = MH(2,2)

TABLE 19. INPUT BC DATA SET

3.84100E 04	3.06000E 02	3.06000E 02	2.72000E 04	3.13000E 02
3.13000E 02	6.83100E 04	6.83100E 04	6.55700E 04	6.55700E 04
2.22050E 04	3.13720E 02	7.33000E 00	7.33000E 00	-3.00000E 00
4.00000E 00	3.00000E 00	-1.50000E 00	0.0	2.37000E 04
3.50000E 04	9.60000E-01	1.10000E 00	1.31000E 00	0.0
2.37000E 04	3.50000E 04	9.60000E-01	1.10000E 00	1.31000E 00
1.53300E 02	1.38000E 02	9.50000E 00	1.93500E 02	4.71000E 05
3.49000E 01	3.35000E 01	4.90357E 01	4.22667E 01	1.64730E 02
1.90350E 02	2.61700E-01	3.85560E 00	3.86100E 02	3.85830E 01
5.00000E 01	6.65000E 01	8.30000E 01	9.95000E 01	1.16000E 02
1.32500E 02	1.49000E 02	1.65500E 02	1.82000E 02	1.98500E 02
2.15000E 02	4.00000E-01	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	4.90357E 01	4.22667E 01
1.64730E 02	1.90350E 02	2.61700E-01	3.85560E 00	3.86100E 02
3.85830E 01	5.00000E 01	6.65000E 01	8.30000E 01	9.95000E 01
1.16000E 02	1.32500E 02	1.49000E 02	1.65500E 02	1.82000E 02
1.98500E 02	2.15000E 02	4.00000E-01	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	3.35000E 01
6.90000E 01	2.50000E-01	4.50000E 01	-2.89700E 01	4.90343E 01
4.22707E 01	4.09220E 02	9.76500E 01	3.01695E-01	3.53440E 00
9.91500E 01	1.87200E 01	2.60000E 01	3.32000E 01	4.04000E 01
4.76000E 01	5.48000E 01	6.20000E 01	6.92000E 01	7.64000E 01
8.36000E 01	9.08000E 01	9.80000E 01	1.05200E 02	4.00000E-01
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	4.97590E 01	4.16698E 01	3.96050E 02	1.25240E 02
2.65330E-01	1.59800E 00	6.96770E 01	1.05525E 01	2.15500E 01
3.03100E 01	3.90700E 01	4.78300E 01	5.65900E 01	6.53500E 01
7.41100E 01	8.28700E 01	9.16300E 01	1.00390E 02	1.09150E 02
1.17910E 02	4.00000E-01	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
1.06000E 00	1.68500E 00	1.57500E 00	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0

TABLE 20. INPUT BF DATA SET

1.05000E 00	1.05000E 00	4.22670E 01	2.40870E 02	4.12100E 02
2.90600E 02	2.38400E 02	2.50600E 02	1.75200E 02	1.36500E 02
1.19000E 02	7.42000E 01	4.51000E 01	2.43000E 01	3.31900E-01
4.46600E-01	4.75900E-01	4.84200E-01	4.63700E-01	4.99100E-01
4.78400E-01	4.48500E-01	4.28500E-01	5.37400E-01	4.22670E 01
2.40870E 02	4.12100E 02	2.90600E 02	2.38400E 02	2.50600E 02
1.75200E 02	1.36500E 02	1.19000E 02	7.42000E 01	4.51000E 01
2.43000E 01	3.31900E-01	4.46600E-01	4.75900E-01	4.84200E-01
4.63700E-01	4.99100E-01	4.78400E-01	4.48500E-01	4.28500E-01
5.37400E-01	0.0	2.00000E 01	4.50000E 01	4.70000E 01
6.00000E 01	1.20000E 02	1.60000E 02	2.00000E 02	2.40000E 02
2.80000E 02	3.20000E 02	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	1.40000E 11	1.40000E 11	1.41000E 10	1.39000E 10
1.16000E 10	6.00000E 09	2.60000E 09	1.15000E 09	5.50000E 08
3.50000E 08	3.00000E 08	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	9.20000E 10	9.20000E 10	9.30000E 09	9.20000E 09
7.96000E 09	5.65000E 09	2.25000E 09	8.50000E 06	2.60000E 08
2.10000E 06	1.70000E 08	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0				

TABLE 21. INTERPOLATED AERODYNAMIC DATA

SUBSONIC DATA

VALUES FROM BCLA/K TABLES FOR AR= 3.8556 SWB= 47.07 TR= 0.2617 BA/K= 3.9428

TR=	0.0	0.25	0.50	1.00	
	0.05348	0.05340	0.05140	0.04761	(WING)

VALUES FROM LOADING TABLES FOR MN= 0.367

1.34059	1.19621	1.10823	0.96240	STA= 0.0
1.22852	1.16908	1.14557	1.12861	STA= 0.383
0.85683	0.93744	0.99356	1.08126	STA= 0.707
0.37612	0.55667	0.61396	0.67689	STA= 0.924

SUPERSONIC DATA

AR= 3.8556 TR= 0.2617 BA= 1.7668 BM= 0.3979

TR= 0.0 0.25 0.50 1.00 (WING)

VALUES FROM LOADING TABLES FOR MN= 1.050

1.49775	1.17622	0.97766	0.79550	STA= 0.0
1.45710	1.33428	1.31289	1.21675	STA= 0.383
1.13541	1.30192	1.46587	1.44676	STA= 0.707
0.61892	0.81251	0.80966	0.65049	STA= 0.924

MN= 1.050

STATION	LOADING AT DATA STATIONS
0.0	1.16427
0.38300	1.33160
0.70700	1.30965
0.92400	0.81495
1.00000	0.0

TABLE 21. INTERPOLATED AERODYNAMIC DATA (CONT)

MN= 1.050 DF= 0.0

STATION	WING OUTB LONG	WING INBD LONG	FLAP INCR
1.00000	0.0	0.0	0.0
0.91447	0.08115	0.03653	0.04461
0.82894	0.12804	0.05036	0.07767
0.74341	0.17559	0.06048	0.11511
0.65788	0.23900	0.07573	0.16328
0.57235	0.31540	0.10339	0.21201
0.48683	0.40193	0.13960	0.26232
0.40130	0.56997	0.17533	0.39464
0.31577	0.84779	0.21565	0.63214
0.23024	0.96921	0.31283	0.65638
0.14471	1.02427	0.48415	0.54012
0.0	1.05540	0.64714	0.40825

TABLE 21. INTERPOLATED AERODYNAMIC DATA (CONCL)

```
AR=  3.5344    TR= 0.3019    BA=  1.6197    BM=  0.3979

TR=       0.0       0.25       0.50       1.00    (HOR TAIL)

   VALUES FROM LOADING TABLES FOR MN= 1.050

      1.56779   1.22710   1.02270   0.83722   STA= 0.0

      1.51018   1.37684   1.36066   1.26379   STA= 0.383

      1.17146   1.34236   1.52054   1.48327   STA= 0.707

      0.63376   0.81399   0.81261   0.85712   STA= 0.924

AR=  3.1960    TR= 0.2653    BA=  1.4646    BM=  0.3879

TR=       0.0       0.25       0.50       1.00    (VERT TAIL)

   VALUES FROM LOADING TABLES FOR MN= 1.050

      1.61315   1.25576   1.04946   0.86701   STA= 0.0

      1.55051   1.40412   1.39613   1.29877   STA= 0.383

      1.20098   1.37384   1.57827   1.51917   STA= 0.707

      0.64606   0.81652   0.81571   0.86409   STA= 0.924
```

HOR TAIL

STATION	LOADING AT DATA STATIONS
0.0	1.17510
0.38300	1.37055
0.70700	1.37891
0.92400	0.81645
1.00000	0.0

VERT TAIL

STATION	LOADING AT DATA STATIONS
0.0	1.23900
0.38300	1.40084
0.70700	1.38554
0.92400	0.81923
1.00000	0.0

TABLE 22. WFLEX LOADING MATRICES

RIGID LOAD ON STRIPS (ALPHA, DELTA FLAP, AND NZ) (AFW Matrix)

COLUMN NO. = 1

9.80337E-02	1.00846E-01	1.02855E-01	1.04083E-01	1.04835E-01	1.04772E-01	1.01050E-01	9.24351E-02
7.78254E-02	3.42254E-02						

COLUMN NO. = 2

1.64784E-01	1.77458E-01	1.41410E-01	9.04782E-02	6.53257E-02	5.16845E-02	3.63391E-02	2.65497E-02
1.68414E-02	6.14430E-03						

COLUMN NO. = 3

-2.33352E-01	-1.64553E-01	-1.34994E-01	-1.41903E-01	-9.92073E-02	-7.72933E-02	-6.73839E-02	-4.26159E-02
-2.55379E-02	-1.37599E-02						

CHORDWISE C.P. ON STRIPS (X/C), RIGID LOADS (AFWCP Matrix)

COLUMN NO. = 1

5.80000E-01	5.80000E-01	5.80000E-01	5.80000E-01	5.80000E-01	5.80000E-01	5.80000E-01	5.80000E-01
5.80000E-01	5.80000E-01						

COLUMN NO. = 2

4.65386E-01	4.65386E-01	4.65386E-01	4.65386E-01	4.65386E-01	4.65386E-01	4.65386E-01	4.65386E-01
4.65386E-01	4.65386E-01						

COLUMN NO. = 3

3.31900E-01	4.46600E-01	4.75900E-01	4.64200E-01	4.63700E-01	4.99100E-01	4.78400E-01	4.46500E-01
4.28500E-01	5.37400E-01						

TABLE 22. WFLEX LOADING MATRICES (CONT)

```
                          FLEXIBLE LOAD ON STRIPS   (AFWF Matrix)

   COLUMN NO. =   1

 9.20860E-02  8.65268E-02  8.38896E-02  7.75115E-02  6.90841E-02  5.96213E-02  4.67020E-02  3.57144E-02
 2.49692E-02  1.03641E-02

   COLUMN NO. =   2

 1.61676E-01  1.69876E-01  1.30479E-01  7.66667E-02  4.90090E-02  3.37250E-02  1.98886E-02  9.69606E-03
 2.91944E-03  1.12185E-04

   COLUMN NO. =   3

-2.28764E-01 -1.55008E-01 -1.20814E-01 -1.23113E-01 -7.58492E-02 -5.06720E-02 -3.91128E-02 -1.58653E-02
-3.57190E-03 -4.05184E-03

                          DELTA FLEX LOAD ON STRIPS   (AFWDF Matrix)

   COLUMN NO. =   1

-5.94777E-03 -1.23192E-02 -1.89649E-02 -2.65710E-02 -3.57509E-02 -4.51510E-02 -5.43484E-02 -5.67207E-02
-5.28562E-02 -2.38613E-02

   COLUMN NO. =   2

-3.70830E-03 -7.58171E-03 -1.09311E-02 -1.36115E-02 -1.63166E-02 -1.79595E-02 -1.84505E-02 -1.66536E-02
-1.39219E-02 -6.03211E-03

   COLUMN NO. =   3

 4.58637E-03  9.54431E-03  1.41601E-02  1.87899E-02  2.33561E-02  2.66214E-02  2.82711E-02  2.62106E-02
 2.19660E-02  9.70807E-03
```

TABLE 22. WFLEX LOADING MATRICES (CONCL)

RIGID, FLEX, DELTA FLEX LOADS, AND F/R RATIOS

ROW NO. = 1

9.20961E-01 5.88469E-01 -3.32492E-01 6.38973E-01

ROW NO. = 2

7.79014E-01 6.53447E-01 -1.25567E-01 8.38813E-01

ROW NO. = 3

-1.00000E 00 -8.16762E-01 1.83236E-01 8.16762E-01

TABLE 23. SPANWISE LOADING DISTRIBUTION

ANALYSIS STATIONS	LOADING-FLEXIBLE ALPHA EFFECT	ANALYSIS STATIONS	LOADING-RIGID FLAP EFFECT
1.00000	0.0	1.00000	0.0
0.92873	0.18109	0.92873	0.11429
0.85746	0.31347	0.85746	0.21640
0.78618	0.41756	0.78618	0.31041
0.71491	0.52389	0.71491	0.42396
0.64363	0.64791	0.64363	0.55174
0.57236	0.75473	0.57236	0.68318
0.50108	0.84218	0.50108	0.84346
0.42981	0.92030	0.42981	1.14465
0.35853	0.98083	0.35853	1.65334
0.28726	1.02695	0.28726	2.03326
0.21598	1.06672	0.21598	1.99504
0.0	0.54620	0.0	1.52710

ANALYSIS STATIONS	TOR LODG	ANALYSIS STATIONS	TOR LODG
1.00000	0.0	1.00000	0.0
0.92873	-1.5983	0.92873	-0.3534
0.85746	-3.1774	0.85746	-0.7640
0.78618	-4.8116	0.78618	-1.2540
0.71491	-6.7853	0.71491	-1.9271
0.64363	-9.3877	0.64363	-2.7869
0.57236	-11.9803	0.57236	-3.7837
0.50108	-14.5777	0.50108	-5.1219
0.42981	-17.2531	0.42981	-7.5801
0.35853	-19.8076	0.35853	-11.7061
0.28726	-22.2242	0.28726	-15.3922
0.21598	-24.5857	0.21598	-15.6722
0.0	-22.7147	0.0	-40.0398

TABLE 23. SPANWISE LOADING DISTRIBUTION (CONT)

ANALYSIS STATIONS	INCREMENT LOADING-FLAP AEROELASTIC
1.00000	0.0
0.92873	-0.10513
0.85746	-0.17125
0.78618	-0.19705
0.71491	-0.21416
0.64363	-0.21365
0.57236	-0.20182
0.50108	-0.18179
0.42981	-0.15619
0.35853	-0.12781
0.28726	-0.09559
0.21598	-0.05813
0.0	0.0

ANALYSIS STATIONS	INCREMENT LOADING-INERTIA AEROELASTIC
1.00000	0.0
0.92873	0.16751
0.85746	0.26959
0.78618	0.30645
0.71491	0.32923
0.64363	0.32027
0.57236	0.29429
0.50108	0.25545
0.42981	0.21074
0.35853	0.16579
0.28726	0.12072
0.21598	0.07268
0.0	0.0

ANALYSIS STATIONS	TOR LODG
1.00000	0.0
0.92873	0.9330
0.85746	1.7224
0.78618	2.2706
0.71491	2.7766
0.64363	3.0810
0.57236	3.2006
0.50108	3.1463
0.42981	2.9281
0.35853	2.5810
0.28726	2.0690
0.21598	1.3260
0.0	0.0

ANALYSIS STATIONS	TOR LODG
1.00000	0.0
0.92873	-1.4862
0.85746	-2.7121
0.78618	-3.5313
0.71491	-4.2685
0.64363	-4.6193
0.57236	-4.6668
0.50108	-4.4307
0.42981	-3.9512
0.35853	-3.3482
0.28726	-2.6152
0.21598	-1.6539
0.0	0.0

TABLE 23. SPANWISE LOADING DISTRIBUTION (CONCL)

ANALYSIS STATIONS	LOADING-(HOR TAIL)	ANALYSIS STATIONS	LOADING-(VERT TAIL)
1.00000	0.0	1.00000	0.0
0.93661	0.70005	0.93114	0.75481
0.87251	1.06136	0.86196	1.09296
0.80841	1.20845	0.79278	1.24102
0.74430	1.32003	0.72360	1.35903
0.68020	1.40389	0.65443	1.42191
0.61610	1.41453	0.58525	1.42660
0.55199	1.40742	0.51607	1.42065
0.48789	1.39507	0.44689	1.41111
0.42379	1.38048	0.37771	1.39991
0.35969	1.36407	0.30854	1.38215
0.29558	1.34036	0.23936	1.35675
0.0	1.17510	0.0	1.23900

STATION	DX SWEEP	STATION	DX SWEEP
1.00000	0.873	1.00000	0.983
0.93661	1.000	0.93114	1.171
0.87251	1.130	0.86196	1.359
0.80841	1.259	0.79278	1.547
0.74430	1.388	0.72360	1.736
0.68020	1.518	0.65443	1.924
0.61610	1.647	0.58525	2.112
0.55199	1.776	0.51607	2.301
0.48789	1.906	0.44689	2.489
0.42379	2.035	0.37771	2.677
0.35969	2.164	0.30854	2.865
0.29558	2.294	0.23936	3.054
0.0	20.128	0.0	17.942

TABLE 24. USPANF SPANWISE UNIT DISTRIBUTIONS

WING FLEXIBLE ALPHA PARAMETERS   MN= 1.050   CLA= 2.83530

DXTOTAL= 175.75   YW(B)= 95.85   DXW(B)= 188.02   DXB(W)= 64.11

SIDE OF BODY UNITS

USZWB= 0.83869   UMXWB= 52.289   UMYWB= -68.303

SPANWISE UNIT DISTRIBUTIONS

STA SWEPT	USZW(B)	UMXW(B) SWEEP	UMYW(B) SWEEP
1.0000	0.0	0.0	0.0
0.9287	0.00944	0.105	-0.083
0.8575	0.03524	0.603	-0.332
0.7862	0.07337	1.814	-0.749
0.7149	0.12247	3.997	-1.354
0.6436	0.18359	7.409	-2.198
0.5724	0.25675	12.318	-3.312
0.5011	0.34005	18.971	-4.697
0.4298	0.43198	27.578	-6.358
0.3585	0.53114	38.314	-8.291
0.2873	0.63586	51.324	-10.483
0.2160	0.74506	66.718	-12.925
0.0	1.00000	125.668	-20.401

TABLE 24. USPANF SPANWISE UNIT DISTRIBUTIONS (CONT)

RIGID FLAP DOWN PARAMETERS DF= 0.0 KBF= 0.31051 MN= 1.050

DXTOTAL= 149.75 YW(B)= 86.57 DXW(B)= 165.01 DXB(W)= 60.24

SIDE OF BODY UNITS

USZWB= 0.75682 UMXWB= 40.167 UMYWB= -44.217

SPANWISE UNIT DISTRIBUTIONS

STA SWEPT	USZW(B)	UMXW(B) SWEEP	UMYW(B) SWEEP
1.0000	0.0	0.0	0.0
0.9287	0.00399	0.045	-0.012
0.8575	0.01555	0.262	-0.051
0.7862	0.03396	0.814	-0.122
0.7149	0.05962	1.857	-0.233
0.6436	0.09371	3.567	-0.398
0.5724	0.13687	6.137	-0.627
0.5011	0.19021	9.783	-0.939
0.4298	0.25968	14.799	-1.382
0.3585	0.35746	21.678	-2.056
0.2873	0.48628	31.084	-3.003
0.2160	0.62704	43.495	-4.089
0.0	1.00000	98.458	-9.988

TABLE 24. USPANF SPANWISE UNIT DISTRIBUTIONS (CONT)

AEROELASTIC FLAP PARAMETERS DF= 0.0 MN= 1.050

DXTOTAL= 211.96 YW(B)= 129.71 DXW(B)= 214.53 DXB(W)= 71.56

SIDE OF BODY UNITS

USZWB= 0.97704 UMXWB= 94.001 UMYWB=-105.468

SPANWISE UNIT DISTRIBUTIONS

STA SWEPT	USZW(B)	UMXW(B) SWEEP	UMYW(B) SWEEP
1.0000	0.0	0.0	0.0
0.9287	0.02950	0.329	-0.262
0.8575	0.10707	1.851	-1.007
0.7862	0.21043	5.391	-2.128
0.7149	0.32584	11.369	-3.544
0.6436	0.44591	19.972	-5.188
0.5724	0.56251	31.214	-6.951
0.5011	0.67017	44.955	-8.732
0.4298	0.76502	60.955	-10.437
0.3585	0.84473	78.900	-11.983
0.2873	0.90742	98.432	-13.288
0.2160	0.95056	119.145	-14.241
0.0	1.00000	185.037	-15.369

TABLE 24. USPANF SPANWISE UNIT DISTRIBUTIONS (CONT)

AEROELASTIC INERTIA PARAMETERS   WEIGHT= 27200.   FSCG= 313.00   MN= 1.050

DXTOTAL= 215.10   YW(B)= 133.24   DXW(B)= 217.36   DXB(W)= 71.67

SIDE OF BODY UNITS

USZWB= 0.98031   UMXWB= 97.778   UMYWB=-108.594

SPANWISE UNIT DISTRIBUTIONS

STA SWEPT	USZW(B)	UMXW(B) SWEEP	UMYW(B) SWEEP
1.0000	0.0	0.0	0.0
0.9287	0.03238	0.361	-0.287
0.8575	0.11688	2.025	-1.099
0.7862	0.22823	5.872	-2.306
0.7149	0.35112	12.330	-3.814
0.6436	0.47667	21.558	-5.532
0.5724	0.59547	33.510	-7.327
0.5011	0.70174	47.971	-9.085
0.4298	0.79186	64.622	-10.706
0.3585	0.86465	83.088	-12.117
0.2873	0.92004	102.983	-13.270
0.2160	0.95742	123.913	-14.095
0.0	1.00000	190.037	-15.064

TABLE 24. USPANF SPANWISE UNIT DISTRIBUTIONS (CONT)

HOR TAIL PARAMETERS MN= 1.050

CLA= 4.33218 KH(B)=0.76509 YH= 49.76 DXH= 90.21

SIDE OF BODY UNITS

USZHB= 0.76509 UMXHB= 28.885 UMYHB= -28.378

SPANWISE UNIT DISTRIBUTIONS

STA SWEPT	USZH(B)	UMXH(B) SWEEP	UMYH(B) SWEEP
1.0000	0.0	0.0	0.0
0.9366	0.01810	0.087	-0.018
0.8725	0.06416	0.487	-0.068
0.8084	0.12352	1.400	-0.139
0.7443	0.18963	2.924	-0.227
0.6802	0.26086	5.115	-0.330
0.6161	0.33456	8.012	-0.447
0.5520	0.40835	11.626	-0.573
0.4879	0.48163	15.956	-0.708
0.4238	0.55421	20.995	-0.851
0.3597	0.62598	26.736	-1.002
0.2956	0.69670	33.171	-1.159
0.0	1.00000	71.231	-4.382

TABLE 24. USPANF SPANWISE UNIT DISTRIBUTIONS (CONCL)

VERT TAIL PARAMETERS MN= 1.050

CYB= 3.99680 KV(B)=0.82507 DZV= 56.23 DXV= 105.65

TOP OF BODY UNITS

USYVB= 0.82507 UMXVB= 38.081 UMZVB= -36.720

SPANWISE UNIT DISTRIBUTIONS

STA SWEPT	USYV(B)	UMXV(B) SWEEP	UMZV(B) SWEEP
1.0000	0.0	0.0	0.0
0.9311	0.02078	0.121	-0.024
0.8620	0.07189	0.665	-0.090
0.7928	0.13644	1.886	-0.184
0.7236	0.20836	3.908	-0.302
0.6544	0.28527	6.802	-0.443
0.5852	0.36406	10.609	-0.602
0.5161	0.44281	15.340	-0.776
0.4469	0.52113	20.992	-0.964
0.3777	0.59886	27.559	-1.164
0.3085	0.67583	35.033	-1.378
0.2394	0.75159	43.402	-1.602
0.0	1.00000	78.937	-4.126

TABLE 25. COMPONENT LIMIT AIRLOADS AND CENTERS OF PRESSURE

```
CONDITION NO=  6030.      MN= 1.050      ALT= 20000.      DF=  0.0

BODY LOADS
PZN=    1352.    PYN=  2511.     XBN=    79.91

WING PANEL LOAD
PZW(B)/2=    11995.    YBW(B)=  96.83    XBW(B)=  353.53

WING CARRY-OVER LOAD
PZB(W)=    4505.    XBB(W)=  276.67

HORIZONTAL TAIL LOADS
PZH/2=  -1324.    YBH= 49.76    XBH=  499.43    DMXH=   19760.

VERTICAL TAIL LOAD
PYV=  13155.    ZBV= 56.23    XBV=  501.70

AIRPLANE INERTIA FACTORS
NZ=  1.00    NY=  0.58    QDOT=  0.0      RDOT= -1.848

COMPONENT SPANWISE FACTORS
PZWB1=   27848.     PZWB2=        0.     PZWB3=      0.     PZWB4=    647.     PZHB=  -2647.
```

TABLE 26. WING LIMIT AIRLOAD DISTRIBUTIONS

WING LOADS COND NO= 6031. MN= 1.050 ALT= 20000. DF= 0.0

BODY INT= 33.50IN SHEAR SOB= 11995.LB BENDM SOB= 759712.IN-LB TORSM SOB= -986196.IN-LB

STATION (IN)	SHEAR (LB)	BEND MOM (IN-LB)	TORS MOM (IN-LB)
312.81	0.	0.	0.
290.52	142.	1583.	-1254.
268.22	528.	9057.	-4985.
245.93	1095.	27160.	-11177.
223.63	1819.	59649.	-20088.
201.34	2711.	110144.	-32396.
179.04	3768.	162363.	-46469.
156.74	4962.	279679.	-65346.
134.45	6271.	464902.	-91966.
112.15	7675.	560374.	-119361.
89.86	9151.	747955.	-150260.
67.56	10684.	969078.	-184523.

TABLE 27. HORIZONTAL TAIL LIMIT AIRLOAD DISTRIBUTIONS

HORIZONTAL TAIL LOADS COND NO= 6034. MN= 1.050 ALT= 20000.

BODY INT= 26.00IN SHEAR SOB= -1013.LB BENDM SOB= -38232.IN-LB TORSM SOB= 37561.IN-LB

STATION (IN)	SHEAR (LB)	BEND MOM (IN-LB)	TORS MOM (IN-LB)
151.78	0.	0.	0.
142.16	-24.	-115.	24.
132.43	-85.	-645.	90.
122.70	-163.	-1853.	184.
112.97	-251.	-3870.	300.
103.24	-345.	-6770.	437.
93.51	-443.	-10604.	592.
83.78	-540.	-15388.	759.
74.05	-637.	-21119.	937.
64.32	-734.	-27788.	1127.
54.59	-829.	-35387.	1326.
44.86	-922.	-43904.	1535.

TABLE 28. VERTICAL TAIL LIMIT AIRLOAD DISTRIBUTIONS

VERTICAL TAIL LOADS   COND NO= 6035.   MN= 1.650   ALT= 20000.

BODY INT= 21.55IN   SHEAR SOB= 10854.LB   BENDM SOB= 500967.IN-LB   TORSM SOB= -23068.IN-LB

STATION (IN)	SHEAR (LB)	BEND MOM (IN-LB)	TORS MOM (IN-LB)
169.51	0.	0.	0.
157.64	273.	1596.	-320.
146.11	946.	8744.	-1182.
134.39	1795.	24813.	-2421.
122.66	2741.	51408.	-3978.
110.93	3753.	89484.	-5831.
99.21	4769.	139569.	-7923.
87.48	5825.	201805.	-10209.
75.75	6856.	276157.	-12676.
64.03	7876.	362547.	-15317.
52.30	8891.	460870.	-18122.
40.57	9887.	570971.	-21071.

TABLE 29. WFLEX INPUT DATA

```
                         DATA FROM SUBROUTINE FLXSIC

  NS = 10               NOEIGJ = 11

  CR =  190.35  IN.     BO2 =  231.50  IN.      BLBS =  33.50  IN.

  ANGLE = 49.036  DEG.  FSLERT =  164.73  IN.

  ANGEA = 42.267  DEG.  FSEAO =  240.87  IN.

  WLAMDA = 0.262        XOCFWD = 0.150          XOCAFT = 0.650

                        ELASTIC AXIS Y COORDINATES FOR WING EI AND GJ

   COLUMN NO. =   1

0.0            2.00000E 01  4.50000E 01  4.70000E 01  8.00000E 01  1.20000E 02  1.60000E 02  2.00000E 02
2.40000E 02  2.80000E 02  3.20000E 02

                                    EI

   COLUMN NO. =   1

1.40000E 11  1.40000E 11  1.41000E 10  1.39000E 10  1.16000E 10  6.00000E 09  2.60000E 09  1.15000E 09
5.50000E 08  3.50000E 08  3.00000E 08

                                    GJ

   COLUMN NO. =   1

9.20000E 10  9.20000E 10  9.30000E 09  9.20000E 09  7.96000E 09  5.65000E 09  2.25000E 09  8.56000E 08
2.60000E 08  2.10000E 08  1.70000E 08
```

TABLE 30. FLXSIC GEOMETRY

SIC FUSELAGE STATIONS

COLUMN NO. = 1

2.39313E 02	3.21314E 02	2.60313E 02	3.36304E 02	2.81312E 02	3.51294E 02	3.02312E 02	3.66284E 02
3.23312E 02	3.81274E 02	3.44312E 02	3.96264E 02	3.65312E 02	4.11254E 02	3.86312E 02	4.26244E 02
4.07311E 02	4.41233E 02	4.28311E 02	4.56223E 02				

SIC BUTT LINES

COLUMN NO. = 1

4.33999E 01	4.33999E 01	6.31997E 01	6.31997E 01	8.29995E 01	8.29995E 01	1.02799E 02	1.02799E 02
1.22599E 02	1.22599E 02	1.42399E 02	1.42399E 02	1.62199E 02	1.62199E 02	1.81998E 02	1.81998E 02
2.01798E 02	2.01798E 02	2.21598E 02	2.21598E 02				

SIC ELASTIC AXIS X COORDINATES

COLUMN NO. = 1

-3.03408E 01	3.03447E 01	-2.81162E 01	2.81219E 01	-2.58915E 01	2.58986E 01	-2.36668E 01	2.36759E 01
-2.14419E 01	2.14531E 01	-1.92172E 01	1.92301E 01	-1.69925E 01	1.70072E 01	-1.47676E 01	1.47843E 01
-1.25429E 01	1.25613E 01	-1.03182E 01	1.03384E 01				

SIC ELASTIC AXIS Y COORDINATES

COLUMN NO. = 1

3.10710E 01	8.62207E 01	5.98472E 01	1.10955E 02	8.86235E 01	1.35689E 02	1.17400E 02	1.60424E 02
1.46176E 02	1.85158E 02	1.74952E 02	2.09892E 02	2.03729E 02	2.34627E 02	2.32505E 02	2.59361E 02
2.61281E 02	2.84095E 02	2.90057E 02	3.08830E 02				

TABLE 31. DELTA SIC, BENDING (IN./LB) MATRIX

ROW NO. = 1

6.95994E-08	2.56968E-07	1.67365E-07	3.41002E-07	2.65131E-07	4.25035E-07	3.62897E-07	5.09068E-07
4.60663E-07	5.93102E-07	5.58429E-07	6.77136E-07	6.56194E-07	7.61169E-07	7.53961E-07	8.45203E-07
6.51726E-07	9.29236E-07	9.49491E-07	1.01327E-06				

ROW NO. = 2

2.56968E-07	3.84425E-06	1.17032E-06	6.35199E-06	4.08785E-06	8.65972E-06	7.00539E-06	1.13675E-05
9.92294E-06	1.38752E-05	1.28405E-05	1.63829E-05	1.57580E-05	1.88907E-05	1.86755E-05	2.13984E-05
2.15931E-05	2.39061E-05	2.45106E-05	2.64138E-05				

ROW NO. = 3

1.67365E-07	1.17032E-06	7.12883E-07	2.07946E-06	1.46233E-06	2.74083E-06	2.25178E-06	3.40220E-06
3.02123E-06	4.06357E-06	3.79068E-06	4.72494E-06	4.56012E-06	5.38632E-06	5.32958E-06	6.04769E-06
6.09903E-06	6.70906E-06	6.86847E-06	7.37043E-06				

ROW NO. = 4

3.41002E-07	6.35199E-06	2.07946E-06	1.16681E-05	6.68404E-06	1.76098E-05	1.33641E-05	2.33516E-05
2.00442E-05	2.90934E-05	2.67242E-05	3.48351E-05	3.34043E-05	4.05770E-05	4.00844E-05	4.63187E-05
4.67644E-05	5.20605E-05	5.34445E-05	5.78023E-05				

ROW NO. = 5

2.65131E-07	4.08785E-06	1.48233E-06	6.68404E-06	4.37106E-06	9.61977E-06	7.58014E-06	1.23781E-05
1.07692E-05	1.51364E-05	1.39983E-05	1.78947E-05	1.72073E-05	2.06530E-05	2.04164E-05	2.34114E-05
2.36255E-05	2.61697E-05	2.68346E-05	2.89280E-05				

ROW NO. = 6

4.25035E-07	8.85972E-06	2.74083E-06	1.76096E-05	9.61977E-06	2.80303E-05	1.98674E-05	3.90697E-05
3.27107E-05	5.01090E-05	4.55540E-05	6.11483E-05	5.83972E-05	7.21875E-05	7.12405E-05	8.32268E-05
8.40838E-05	9.42661E-05	9.69270E-05	1.05305E-04				

ROW NO. = 7

3.62897E-07	7.00539E-06	2.25178E-06	1.33641E-05	7.58014E-06	1.98674E-05	1.50161E-05	2.69200E-05
2.29779E-05	3.37635E-05	3.09397E-05	4.06070E-05	3.89016E-05	4.74506E-05	4.68636E-05	5.42942E-05
5.48254E-05	6.11377E-05	6.27872E-05	6.79812E-05				

ROW NO. = 8

TABLE 31. DELTA SIC, BENDING (IN./LB) MATRIX (CONT)

5.09068E-07	1.13675E-05	3.40220E-06	2.33516E-05	1.23781E-05	3.90697E-05	2.69200E-05	5.81613E-05
4.67180E-05	7.80274E-05	6.98303E-05	5.78933E-05	9.29426E-05	1.17759E-04	1.16055E-04	1.37625E-04
1.39167E-04	1.57491E-04	1.62260E-04	1.77357E-04				
ROW NO. = 9							
4.60663E-07	9.92294E-06	3.02123E-06	2.00442E-05	1.07892E-05	3.27107E-05	2.29779E-05	4.67180E-05
3.91925E-05	6.18360E-05	5.59077E-05	7.62033E-05	7.26229E-05	9.05707E-05	8.93383E-05	1.04938E-04
1.06053E-04	1.19306E-04	1.22769E-04	1.33673E-04				
ROW NO. = 10							
5.93102E-07	1.38752E-05	4.06357E-06	2.90934E-05	1.51364E-05	5.01090E-05	3.37635E-05	7.80274E-05
6.18360E-05	1.12316E-04	9.79592E-05	1.47111E-04	1.38440E-04	1.81906E-04	1.78921E-04	2.16700E-04
2.19461E-04	2.51495E-04	2.59882E-04	2.86289E-04				
ROW NO. = 11							
5.58429E-07	1.28405E-05	3.79068E-06	2.67242E-05	1.39983E-05	4.55540E-05	3.09397E-05	6.98303E-05
5.59077E-05	9.79592E-05	8.70637E-05	1.26389E-04	1.19452E-04	1.54228E-04	1.51840E-04	1.82067E-04
1.84228E-04	2.09906E-04	2.16616E-04	2.37745E-04				
ROW NO. = 12							
6.77136E-07	1.63829E-05	4.72494E-06	3.48351E-05	1.78947E-05	6.11483E-05	4.06070E-05	9.78933E-05
7.62033E-05	1.47111E-04	1.26389E-04	2.04357E-04	1.89558E-04	2.63743E-04	2.58649E-04	3.23129E-04
3.27739E-04	3.82515E-04	3.96829E-04	4.41901E-04				
ROW NO. = 13							
6.56194E-07	1.57580E-05	4.56012E-06	3.34043E-05	1.72073E-05	5.83972E-05	3.89016E-05	9.29426E-05
7.26229E-05	1.38440E-04	1.19452E-04	1.89558E-04	1.75687E-04	2.40518E-04	2.36066E-04	2.92416E-04
2.96445E-04	3.44314E-04	3.56823E-04	3.96212E-04				
ROW NO. = 14							
7.61169E-07	1.88907E-05	5.38632E-06	4.05770E-05	2.06530E-05	7.21875E-05	4.74506E-05	1.17759E-04
9.05707E-05	1.81906E-04	1.54228E-04	2.63743E-04	2.40518E-04	3.62286E-04	3.53678E-04	4.62634E-04
4.70424E-04	5.62982E-04	5.87170E-04	6.63331E-04				
ROW NO. = 15							
7.53961E-07	1.86755E-05	5.32958E-06	4.00844E-05	2.04164E-05	7.12405E-05	4.68636E-05	1.16055E-04

TABLE 31. DELTA SIC, BENDING (IN./LB) MATRIX (CONCL)

8.93383E-05	1.78921E-04	1.51840E-04	2.58649E-04	2.36066E-04	3.53678E-04	3.45878E-04	4.50192E-04
4.57650E-04	5.46264E-04	5.69422E-04	6.42338E-04				
ROW NO. = 16							
8.45203E-07	2.13984E-05	6.04769E-06	4.63187E-05	2.34114E-05	8.32268E-05	5.42942E-05	1.37625E-04
1.04938E-04	2.16700E-04	1.82067E-04	3.23129E-04	2.92416E-04	4.62634E-04	4.50192E-04	6.20363E-04
6.33230E-04	7.86112E-04	8.26064E-04	9.51863E-04				
ROW NO. = 17							
6.51726E-07	2.15931E-05	6.09903E-06	4.67644E-05	2.36255E-05	8.40838E-05	5.48254E-05	1.39167E-04
1.06053E-04	2.19401E-04	1.84228E-04	3.27739E-04	2.96445E-04	4.70424E-04	4.57650E-04	6.33230E-04
6.46679E-04	8.05514E-04	8.47022E-04	9.77717E-04				
ROW NO. = 18							
9.29236E-07	2.39061E-05	6.70906E-06	5.20605E-05	2.61697E-05	9.42661E-05	6.11377E-05	1.57491E-04
1.19306E-04	2.51495E-04	2.09906E-04	3.62515E-04	3.44314E-04	5.62982E-04	5.46264E-04	7.86112E-04
8.05514E-04	1.05609E-03	1.12065E-03	1.32392E-03				
ROW NO. = 19							
9.49491E-07	2.45106E-05	6.86847E-06	5.34445E-05	2.68346E-05	9.69270E-05	6.27872E-05	1.62280E-04
1.22769E-04	2.59882E-04	2.16616E-04	3.96829E-04	3.56623E-04	5.87170E-04	5.69422E-04	8.26064E-04
8.47022E-04	1.12065E-03	1.19739E-03	1.42434E-03				
ROW NO. = 20							
1.01327E-06	2.64138E-05	7.37043E-06	5.78023E-05	2.89280E-05	1.05305E-04	6.79812E-05	1.77357E-04
1.33673E-04	2.86289E-04	2.37745E-04	4.41901E-04	3.96212E-04	6.63331E-04	6.42338E-04	9.51863E-04
9.77717E-04	1.32392E-03	1.42434E-03	1.73689E-03				

TABLE 32. DELTA SIC, TORSION (IN./LB) MATRIX

ROW NO. = 1

3.28066E-07	-3.28108E-07	3.04011E-07	-3.04072E-07	2.79956E-07	-2.80035E-07	2.55901E-07	-2.56000E-07
2.31845E-07	-2.31965E-07	2.07789E-07	-2.07928E-07	1.83734E-07	-1.83893E-07	1.59678E-07	-1.59858E-07
1.35622E-07	-1.35821E-07	1.11567E-07	-1.11786E-07				

ROW NO. = 2

-3.28108E-07	5.41801E-06	-5.02011E-06	5.02113E-06	-4.62290E-06	4.62420E-06	-4.22568E-06	4.22731E-06
-3.82843E-06	3.83043E-06	-3.43121E-06	3.43351E-06	-3.03400E-06	3.03662E-06	-2.63674E-06	2.63972E-06
-2.23953E-06	2.24280E-06	-1.84231E-06	1.84591E-06				

ROW NO. = 3

3.04011E-07	-5.02011E-06	2.11725E-06	-2.11767E-06	1.94972E-06	-1.95027E-06	1.78219E-06	-1.78288E-06
1.61465E-06	-1.61549E-06	1.44712E-06	-1.44809E-06	1.27960E-06	-1.28070E-06	1.11206E-06	-1.11331E-06
9.44528E-07	-9.45910E-07	7.77000E-07	-7.78521E-07				

ROW NO. = 4

-3.04072E-07	5.02113E-06	-2.11767E-06	7.48151E-06	-6.88815E-06	6.89010E-06	-6.29629E-06	6.29873E-06
-5.70439E-06	5.70736E-06	-5.11253E-06	5.11595E-06	-4.52067E-06	4.52458E-06	-3.92877E-06	3.93321E-06
-3.33691E-06	3.34179E-06	-2.74505E-06	2.75043E-06				

ROW NO. = 5

2.79956E-07	-4.62290E-06	1.94972E-06	-6.88815E-06	4.16510E-06	-4.16628E-06	3.60722E-06	-3.80870E-06
3.44931E-06	-3.45111E-06	3.09143E-06	-3.09349E-06	2.73355E-06	-2.73591E-06	2.37563E-06	-2.37832E-06
2.01775E-06	-2.02070E-06	1.65987E-06	-1.66312E-06				

ROW NO. = 6

-2.80035E-07	4.62420E-06	-1.95027E-06	6.89010E-06	-4.16628E-06	9.44540E-06	-8.63137E-06	8.63472E-06
-7.81996E-06	7.82403E-06	-7.00859E-06	7.01328E-06	-6.19724E-06	6.20259E-06	-5.38582E-06	5.39191E-06
-4.57446E-06	4.58115E-06	-3.76310E-06	3.77047E-06				

ROW NO. = 7

2.55901E-07	-4.22568E-06	1.78219E-06	-6.29629E-06	3.80722E-06	-8.63137E-06	5.87389E-06	-5.87617E-06
5.32170E-06	-5.32447E-06	4.76954E-06	-4.77274E-06	4.21740E-06	-4.22104E-06	3.66520E-06	-3.66934E-06
3.11305E-06	-3.11760E-06	2.56090E-06	-2.56591E-06				

ROW NO. = 8

TABLE 32. DELTA SIC, TORSION (IN./LB) MATRIX (CONT)

-2.55600E-07	4.22731E-06	-1.76286E-06	6.29873E-06	-3.80870E-06	8.63472E-06	-5.87617E-06	1.23808E-05
-1.12125E-05	1.12184E-05	-1.00492E-05	1.00559E-05	-8.88563E-06	8.89350E-06	-7.72237E-06	7.73110E-06
-6.55902E-06	6.56862E-06	-5.39567E-06	5.40623E-06				

ROW NO. = 9

2.31845E-07	-3.82843E-06	1.61465E-06	-5.70439E-06	3.44931E-06	-7.81996E-06	5.32170E-06	-1.12125E-05
7.76821E-06	-7.77226E-06	6.96221E-06	-6.96687E-06	6.15623E-06	-6.16154E-06	5.35017E-06	-5.35622E-06
4.54418E-06	-4.55083E-06	3.73820E-06	-3.74552E-06				

ROW NO. = 10

-2.31965E-07	3.83043E-06	-1.61549E-06	5.70736E-06	-3.45111E-06	7.82403E-06	-5.32447E-06	1.12184E-05
-7.77226E-06	1.71838E-05	-1.53929E-05	1.54032E-05	-1.36109E-05	1.36227E-05	-1.18268E-05	1.18422E-05
-1.00466E-05	1.00615E-05	-8.26486E-06	8.28104E-06				

ROW NO. = 11

2.07789E-07	-3.43121E-06	1.44712E-06	-5.11253E-06	3.09143E-06	-7.00859E-06	4.76954E-06	-1.00492E-05
6.96221E-06	-1.53929E-05	1.10969E-05	-1.11043E-05	9.81225E-06	-9.82072E-06	8.52750E-06	-8.53714E-06
7.24286E-06	-7.25346E-06	5.95821E-06	-5.96988E-06				

ROW NO. = 12

-2.07928E-07	3.43351E-06	-1.44809E-06	5.11595E-06	-3.09349E-06	7.01328E-06	-4.77274E-06	1.00559E-05
-6.96687E-06	1.54032E-05	-1.11043E-05	2.42116E-05	-2.13944E-05	2.14129E-05	-1.85932E-05	1.86142E-05
-1.57922E-05	1.58153E-05	-1.29912E-05	1.30166E-05				

ROW NO. = 13

1.83734E-07	-3.03400E-06	1.27960E-06	-4.52067E-06	2.73355E-06	-6.19724E-06	4.21740E-06	-8.88583E-06
6.15623E-06	-1.36109E-05	9.81225E-06	-2.13944E-05	1.63094E-05	-1.63235E-05	1.41740E-05	-1.41900E-05
1.20387E-05	-1.20564E-05	9.90346E-06	-9.92265E-06				

ROW NO. = 14

-1.83893E-07	3.03662E-06	-1.28070E-06	4.52456E-06	-2.73591E-06	6.20259E-06	-4.22104E-06	8.89350E-06
-6.16154E-06	1.36227E-05	-9.82072E-06	2.14129E-05	-1.63235E-05	3.56714E-05	-3.09741E-05	3.10091E-05
-2.63079E-05	2.63464E-05	-2.16418E-05	2.16841E-05				

ROW NO. = 15

1.59678E-07	-2.63674E-06	1.11206E-06	-3.92877E-06	2.37563E-06	-5.38582E-06	3.66520E-06	-7.72237E-06

TABLE 32. DELTA SIC, TORSION (IN./LB) MATRIX (CONCL)

5.35017E-06	-1.18288E-05	8.52750E-06	-1.85932E-05	1.41740E-05	-3.09741E-05	2.54164E-05	-2.54451E-05
2.15875E-05	-2.16191E-05	1.77586E-05	-1.77933E-05				

ROW NO. = 16

-1.59858E-07	2.63972E-06	-1.11331E-06	3.93321E-06	-2.37832E-06	5.39191E-06	-3.66934E-06	7.73110E-06
-5.35622E-06	1.18422E-05	-8.53714E-06	1.86142E-05	-1.41900E-05	3.10091E-05	-2.54451E-05	4.60615E-05
-4.07920E-05	4.08517E-05	-3.35569E-05	3.36226E-05				

ROW NO. = 17

1.35622E-07	-2.23953E-06	9.44528E-07	-3.33691E-06	2.01775E-06	-4.57446E-06	3.11305E-06	-6.55902E-06
4.54418E-06	-1.00468E-05	7.24286E-06	-1.57922E-05	1.20387E-05	-2.63079E-05	2.15875E-05	-4.07920E-05
3.59060E-05	-3.59586E-05	2.95375E-05	-2.95953E-05				

ROW NO. = 18

-1.35821E-07	2.24280E-06	-9.45910E-07	3.34179E-06	-2.02070E-06	4.58115E-06	-3.11760E-06	6.56862E-06
-4.55083E-06	1.00615E-05	-7.25346E-06	1.58153E-05	-1.20564E-05	2.63464E-05	-2.16191E-05	4.08517E-05
-3.59586E-05	5.28395E-05	-4.34040E-05	4.34890E-05				

ROW NO. = 19

1.11567E-07	-1.84231E-06	7.77000E-07	-2.74505E-06	1.65987E-06	-3.76310E-06	2.56090E-06	-5.39567E-06
3.73820E-06	-8.26486E-06	5.95821E-06	-1.29912E-05	9.90346E-06	-2.16418E-05	1.77586E-05	-3.35569E-05
2.95375E-05	-4.34040E-05	3.66232E-05	-3.86988E-05				

ROW NO. = 20

-1.11786E-07	1.84591E-06	-7.78521E-07	2.75043E-06	-1.66312E-06	3.77047E-06	-2.56591E-06	5.40623E-06
-3.74552E-06	8.28104E-06	-5.96988E-06	1.30166E-05	-9.92285E-06	2.16841E-05	-1.77933E-05	3.36226E-05
-2.95953E-05	4.34890E-05	-3.86988E-05	4.93537E-05				

TABLE 33. STRUCTURAL INFLUENCE COEFFICIENTS (IN./LB) MATRIX

ROW NO. = 1

3.97665E-07	-7.11399E-06	4.71376E-07	3.69292E-06	5.45087E-07	1.44999E-07	6.18798E-07	2.53068E-07
6.92507E-07	3.61137E-07	7.66218E-07	4.69208E-07	8.39929E-07	5.77276E-07	9.13638E-07	6.85345E-07
9.87348E-07	7.93415E-07	1.06106E-06	9.01481E-07				

ROW NO. = 2

-7.11399E-08	9.26226E-06	-3.84980E-06	1.13731E-05	-5.35049E-07	1.34839E-05	2.77971E-06	1.55948E-05
6.09451E-06	1.77056E-05	9.40927E-06	1.98164E-05	1.27240E-05	2.19273E-05	1.60388E-05	2.40381E-05
1.93535E-05	2.61489E-05	2.26662E-05	2.82597E-05				

ROW NO. = 3

4.71376E-07	-3.84980E-06	2.83013E-06	-3.82179E-08	3.43205E-06	7.90554E-07	4.03397E-06	1.61931E-06
4.63588E-06	2.44808E-06	5.23780E-06	3.27685E-06	5.83972E-06	4.10561E-06	6.44164E-06	4.93437E-06
7.04355E-06	5.76315E-06	7.64547E-06	6.59191E-06				

ROW NO. = 4

3.69292E-08	1.13731E-05	-3.82179E-06	1.93496E-05	-2.04114E-07	2.44999E-05	7.06782E-06	2.96503E-05
1.43398E-05	3.48008E-05	2.16117E-05	3.99511E-05	2.88836E-05	4.51015E-05	3.61556E-05	5.02519E-05
4.34275E-05	5.54023E-05	5.06994E-05	6.05527E-05				

ROW NO. = 5

5.45067E-07	-5.35049E-07	3.43205E-06	-2.04114E-07	8.53617E-06	5.45349E-06	1.13874E-05	8.56941E-06
1.42385E-05	1.16853E-05	1.70897E-05	1.48012E-05	1.99409E-05	1.79171E-05	2.27921E-05	2.10330E-05
2.56432E-05	2.41490E-05	2.84944E-05	2.72649E-05				

ROW NO. = 6

1.44999E-07	1.34839E-05	7.90554E-07	2.44999E-05	5.45349E-06	3.74757E-05	1.12360E-05	4.77044E-05
2.46906E-05	5.79330E-05	3.85454E-05	6.81615E-05	5.22000E-05	7.83901E-05	6.58547E-05	8.86187E-05
7.95093E-05	9.88473E-05	9.31639E-05	1.09076E-04				

ROW NO. = 7

6.18798E-07	2.77971E-06	4.03397E-06	7.06782E-06	1.13874E-05	1.12360E-05	2.08899E-05	2.10438E-05
2.82996E-05	2.64391E-05	3.57093E-05	3.58343E-05	4.31190E-05	4.32295E-05	5.05287E-05	5.06246E-05
5.79385E-05	5.80201E-05	6.53481E-05	6.54153E-05				

ROW NO. = 8

TABLE 33. STRUCTURAL INVLUENCE COEFFICIENTS (IN./LB) MATRIX (CONT)

2.53068E-07	1.55948E-05	1.61931E-06	2.96503E-05	6.56941E-06	4.77044E-05	2.10438E-05	7.05421E-05
3.55054E-05	8.92457E-05	5.97611E-05	1.07949E-04	6.40566E-05	1.26653E-04	1.08333E-04	1.45356E-04
1.32606E-04	1.64060E-04	1.56684E-04	1.82763E-04				

ROW NO. = 9

6.92507E-07	6.09451E-06	4.63568E-06	1.43398E-05	1.42385E-05	2.48908E-05	2.82996E-05	3.55054E-05
4.69607E-05	5.40637E-05	6.28699E-05	6.92365E-05	7.87792E-05	8.44092E-05	9.46885E-05	9.95819E-05
1.10598E-04	1.14755E-04	1.26507E-04	1.29927E-04				

ROW NO. = 10

3.61137E-07	1.77056E-05	2.44806E-06	3.48008E-05	1.16853E-05	5.79330E-05	2.64391E-05	8.92457E-05
5.40637E-05	1.29500E-04	8.25663E-05	1.62514E-04	1.24829E-04	1.95528E-04	1.67092E-04	2.26542E-04
2.09355E-04	2.61556E-04	2.51617E-04	2.94570E-04				

ROW NO. = 11

7.66218E-07	9.40927E-06	5.23780E-06	2.16117E-05	1.70897E-05	3.85454E-05	3.57093E-05	5.97811E-05
6.28699E-05	8.25663E-05	9.81606E-05	1.15285E-04	1.29264E-04	1.44406E-04	1.60366E-04	1.73530E-04
1.91471E-04	2.02653E-04	2.22575E-04	2.31775E-04				

ROW NO. = 12

4.69208E-07	1.98164E-05	3.27685E-06	3.99511E-05	1.48012E-05	6.81615E-05	3.58343E-05	1.07949E-04
6.92365E-05	1.62514E-04	1.15285E-04	2.28569E-04	1.66164E-04	2.85156E-04	2.40056E-04	3.41743E-04
3.11947E-04	3.98330E-04	3.83838E-04	4.54917E-04				

ROW NO. = 13

8.39929E-07	1.27240E-05	5.63972E-06	2.88836E-05	1.99409E-05	5.22000E-05	4.31190E-05	8.40568E-05
7.87792E-05	1.24829E-04	1.29264E-04	1.66164E-04	1.91996E-04	2.24195E-04	2.50240E-04	2.78226E-04
3.08463E-04	3.32257E-04	3.66727E-04	3.66269E-04				

ROW NO. = 14

5.77276E-07	2.19273E-05	4.10561E-06	4.51015E-05	1.79171E-05	7.83901E-05	4.32295E-05	1.26653E-04
8.44092E-05	1.95528E-04	1.44408E-04	2.85156E-04	2.24195E-04	3.97957E-04	3.22704E-04	4.93643E-04
4.44116E-04	5.89328E-04	5.65528E-04	6.85015E-04				

ROW NO. = 15

9.13636E-07	1.60366E-05	6.44164E-06	3.61556E-05	2.27921E-05	6.58547E-05	5.05287E-05	1.08333E-04

TABLE 33. STRUCTURAL INFLUENCE COEFFICIENTS (IN./LB) MATRIX (CONCL)

9.46885E-05	1.67092E-04	1.60366E-04	2.40056E-04	2.50240E-04	3.22704E-04	3.71294E-04	4.24747E-04
4.79237E-04	5.24645E-04	5.87180E-04	6.24544E-04				

ROW NO. = 16

6.85345E-07	2.40381E-05	4.93437E-06	5.02519E-05	2.10330E-05	8.86187E-05	5.06248E-05	1.45356E-04
9.95819E-05	2.28542E-04	1.73530E-04	3.41743E-04	2.78226E-04	4.93643E-04	4.24747E-04	6.68444E-04
5.92438E-04	8.26963E-04	7.92507E-04	9.85485E-04				

ROW NO. = 17

9.87348E-07	1.93535E-05	7.04355E-06	4.34275E-05	2.56432E-05	7.95093E-05	5.79385E-05	1.32608E-04
1.10598E-04	2.09355E-04	1.91471E-04	3.11947E-04	3.08483E-04	4.44116E-04	4.79237E-04	5.92438E-04
6.82585E-04	7.69555E-04	8.76559E-04	9.48122E-04				

ROW NO. = 18

7.93415E-07	2.61469E-05	5.76315E-06	5.54023E-05	2.41490E-05	9.88473E-05	5.80201E-05	1.64060E-04
1.14755E-04	2.61556E-04	2.02653E-04	3.98330E-04	3.32257E-04	5.89328E-04	5.24645E-04	8.26963E-04
7.69555E-04	1.10893E-03	1.07724E-03	1.36740E-03				

ROW NO. = 19

1.06106E-06	2.26682E-05	7.64547E-06	5.06994E-05	2.84944E-05	9.31639E-05	6.53481E-05	1.56884E-04
1.26507E-04	2.51617E-04	2.22575E-04	3.83838E-04	3.66727E-04	5.65528E-04	5.87180E-04	7.92507E-04
8.76559E-04	1.07724E-03	1.23601E-03	1.38564E-03				

ROW NO. = 20

9.01481E-07	2.82597E-05	6.59191E-06	6.05527E-05	2.72649E-05	1.09076E-04	6.54153E-05	1.62763E-04
1.29927E-04	2.94570E-04	2.31775E-04	4.54917E-04	3.86289E-04	6.85015E-04	6.24544E-04	9.85485E-04
9.48122E-04	1.36740E-03	1.38564E-03	1.76625E-03				

TABLE 34. DTHEDA MATRIX

ROW NO. = 1

1.21949E-02	-1.21949E-02	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 2

0.0	0.0	1.31593E-02	-1.31593E-02	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 3

0.0	0.0	0.0	0.0	1.42894E-02	-1.42894E-02	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 4

0.0	0.0	0.0	0.0	0.0	0.0	1.56319E-02	-1.56319E-02
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 5

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.72527E-02	-1.72527E-02	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 6

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	1.92486E-02	-1.92486E-02	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 7

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	2.17665E-02	-2.17665E-02	0.0	0.0
0.0	0.0	0.0	0.0				

ROW NO. = 8

TABLE 34. DTHEDA MATRIX (CONCL)

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	2.50425E-02	-2.50425E-02
0.0	0.0	0.0	0.0				

ROW NO. = 9

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.94793E-02	-2.94793E-02	0.0	0.0				

ROW NO. = 10

0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	3.58264E-02	-3.58264E-02				

TABLE 35. SICBAR MATRIX (RAD/LB)

ROW NO. = 1

5.71703E-09	-1.13820E-07	5.26963E-08	-1.38244E-07	1.31722E-08	-1.62667E-07	-2.63522E-08	-1.87091E-07
-6.58769E-08	-2.11515E-07	-1.05401E-07	-2.35937E-07	-1.44925E-07	-2.60361E-07	-1.84450E-07	-2.64784E-07
-2.23974E-07	-3.09208E-07	-2.63498E-07	-3.33631E-07				

ROW NO. = 2

5.71703E-09	-2.00323E-07	3.77455E-08	-2.55131E-07	4.78495E-08	-3.11999E-07	-3.99234E-08	-3.68669E-07
-1.27697E-07	-4.25740E-07	-2.15469E-07	-4.82606E-07	-3.03242E-07	-5.39479E-07	-3.91016E-07	-5.96346E-07
-4.78789E-07	-6.53218E-07	-5.66561E-07	-7.10088E-07				

ROW NO. = 3

5.71703E-09	-2.00323E-07	3.77455E-08	-3.53067E-07	4.40498E-08	-4.57580E-07	2.16236E-09	-5.59217E-07
-1.52215E-07	-6.60854E-07	-3.06590E-07	-7.62489E-07	-4.60965E-07	-8.64125E-07	-6.15341E-07	-9.65762E-07
-7.69717E-07	-1.06740E-06	-9.24091E-07	-1.16903E-06				

ROW NO. = 4

5.71703E-09	-2.00323E-07	3.77455E-08	-3.53006E-07	4.40498E-08	-5.70068E-07	-2.40482E-09	-7.73750E-07
-1.12640E-07	-9.50520E-07	-3.76287E-07	-1.12729E-06	-6.39933E-07	-1.30406E-06	-9.03563E-07	-1.48083E-06
-1.16723E-06	-1.65760E-06	-1.43088E-06	-1.83437E-06				

ROW NO. = 5

5.71704E-09	-2.00323E-07	3.77455E-08	-3.53007E-07	4.40497E-08	-5.70068E-07	-2.40595E-09	-9.27165E-07
-1.22546E-07	-1.30146E-06	-3.39816E-07	-1.60929E-06	-7.94484E-07	-1.91710E-06	-1.24916E-06	-2.22492E-06
-1.70382E-06	-2.53272E-06	-2.15848E-06	-2.84053E-06				

ROW NO. = 6

5.71703E-09	-2.00323E-07	3.77455E-08	-3.53007E-07	4.40565E-08	-5.70068E-07	-2.40669E-09	-9.27165E-07
-1.22547E-07	-1.53888E-06	-3.29622E-07	-2.18055E-06	-7.48762E-07	-2.70920E-06	-1.53386E-06	-3.23785E-06
-2.31698E-06	-3.76651E-06	-3.10409E-06	-4.29516E-06				

ROW NO. = 7

5.71703E-09	-2.00323E-07	3.77455E-08	-3.53007E-07	4.40500E-08	-5.70068E-07	-2.40567E-09	-9.27166E-07
-1.22545E-07	-1.53888E-06	-3.29623E-07	-2.54651E-06	-7.00848E-07	-3.78220E-06	-1.57727E-06	-4.68888E-06
-2.95225E-06	-5.59554E-06	-4.32720E-06	-6.50221E-06				

ROW NO. = 8

TABLE 35. SICBAR MATRIX (RAD/LB) (CONCL)

5.71704E-09	-2.00322E-07	3.77456E-08	-3.53065E-07	4.40503E-06	-5.70069E-07	-2.40561E-09	-9.27162E-07
-1.22544E-07	-1.53867E-06	-3.29618E-07	-2.54650E-06	-7.00821E-07	-4.28074E-06	-1.33860E-06	-6.10279E-06
-2.83483E-06	-7.57079E-06	-5.14190E-06	-9.03865E-06				

ROW NO. = 9

5.71702E-09	-2.00323E-07	3.77455E-06	-3.53068E-07	4.40496E-06	-5.70069E-07	-2.40561E-09	-9.27165E-07
-1.22548E-07	-1.53867E-06	-3.29623E-07	-2.54652E-06	-7.00838E-07	-4.28076E-06	-1.33858E-06	-6.91364E-06
-2.56384E-06	-1.00045E-05	-5.91599E-06	-1.23601E-05				

ROW NO. = 10

5.71708E-09	-2.00323E-07	3.77454E-08	-3.53008E-07	4.40496E-08	-5.70069E-07	-2.40652E-09	-9.27168E-07
-1.22548E-07	-1.53887E-06	-3.29625E-07	-2.54651E-06	-7.00835E-07	-4.28078E-06	-1.33862E-06	-6.91370E-06
-2.56386E-06	-1.03955E-05	-5.36078E-06	-1.43522E-05				

TABLE 36. DATA FROM SUBROUTINE WFLEX

```
NS = 10

Q = 751.12 LB/FT**2

CLAR = 4.248

EOTA =1.0000

SW = 386.10 FT**2
```

TABLE 37. D MATRIX

COLUMN NO. = 1

9.99954E-01	-2.85906E-04	-4.76779E-05	-2.94107E-04	-4.66315E-05	-2.99965E-04	-4.94145E-05	-3.03546E-04
-4.97719E-05	-3.05742E-04	-4.97420E-05	-3.05558E-04	-4.79750E-05	-2.94704E-04	-4.38848E-05	-2.69576E-04
-3.69465E-05	-2.26970E-04	-1.62490E-05	-9.98155E-05				

COLUMN NO. = 2

9.40263E-04	1.00578E 00	1.70944E-03	1.05009E-02	1.74349E-03	1.07100E-02	1.76430E-03	1.08379E-02
1.77700E-03	1.09162E-02	1.77599E-03	1.09097E-02	1.71290E-03	1.05221E-02	1.56686E-03	9.62497E-03
1.31922E-03	8.10380E-03	5.80153E-04	3.56380E-03				

COLUMN NO. = 3

-4.42617E-04	-2.71893E-03	9.99681E-01	-1.96140E-03	-3.25656E-04	-2.00046E-03	-3.29544E-04	-2.02434E-03
-3.31927E-04	-2.03898E-03	-3.31728E-04	-2.03776E-03	-3.19944E-04	-1.96537E-03	-2.92668E-04	-1.79782E-03
-2.46410E-04	-1.51366E-03	-1.08364E-04	-6.65664E-04				

COLUMN NO. = 4

1.14050E-03	7.00591E-03	2.16023E-03	1.01339E 00	3.09250E-03	1.89966E-02	3.12941E-03	1.92235E-02
3.15204E-03	1.93626E-02	3.15016E-03	1.93510E-02	3.03825E-03	1.86636E-02	2.77921E-03	1.70723E-02
2.33995E-03	1.43740E-02	1.02905E-03	6.32129E-03				

COLUMN NO. = 5

-1.17125E-04	-7.19483E-04	-4.18040E-04	-2.56796E-03	9.99608E-01	-2.40877E-03	-3.96806E-04	-2.43752E-03
-3.99674E-04	-2.45514E-03	-3.99441E-04	-2.45371E-03	-3.85252E-04	-2.36655E-03	-3.52405E-04	-2.16477E-03
-2.96702E-04	-1.82260E-03	-1.30480E-04	-8.01519E-04				

COLUMN NO. = 6

1.34078E-03	8.23625E-03	2.66831E-03	1.63911E-02	4.01908E-03	1.02469E 00	5.07564E-03	3.11790E-02
5.11234E-03	3.14044E-02	5.10927E-03	3.13855E-02	4.92777E-03	3.02706E-02	4.50763E-03	2.76897E-02
3.79519E-03	2.33133E-02	1.66903E-03	1.02526E-02				

COLUMN NO. = 7

2.08367E-04	1.27997E-03	3.35107E-04	2.05851E-03	-2.82288E-05	-1.73405E-04	1.00001E 00	7.00536E-05
1.14953E-05	7.06138E-05	1.14884E-05	7.05715E-05	1.10867E-05	6.81041E-05	1.01270E-05	6.22086E-05
8.53859E-06	5.24513E-05	3.75771E-06	2.30831E-05				

COLUMN NO. = 8

TABLE 37. D MATRIX (CONT)

1.54108E-03	9.46661E-03	3.15641E-03	1.93894E-02	4.91524E-03	3.01937E-02	6.69192E-03	1.04234E 00
8.32713E-03	5.11524E-02	8.32217E-03	5.11219E-02	6.02653E-03	4.93056E-02	7.34216E-03	4.51020E-02
6.18175E-03	3.79736E-02	2.71657E-03	1.66998E-02				

COLUMN NO. = 9

5.33865E-04	3.27946E-03	1.08826E-03	6.68501E-03	1.33235E-03	8.18446E-03	9.92189E-04	6.09487E-03
1.00108E 00	6.65163E-03	1.06219E-03	6.64772E-03	1.04374E-03	6.41152E-03	9.54727E-04	5.86475E-03
6.03848E-04	4.93792E-03	3.53515E-04	2.17159E-03				

COLUMN NO. = 10

1.74137E-03	1.06970E-02	3.64451E-03	2.23877E-02	5.61140E-03	3.56986E-02	8.47252E-03	5.20455E-02
1.17681E-02	1.07241E 00	1.38539E-02	8.51023E-02	1.33617E-02	8.20792E-02	1.22225E-02	7.50810E-02
1.02906E-02	6.32139E-02	4.52556E-03	2.77999E-02				

COLUMN NO. = 11

8.59358E-04	5.27892E-03	1.84140E-03	1.13115E-02	2.69292E-03	1.65423E-02	3.34836E-03	2.05685E-02
3.12386E-03	1.91894E-02	1.00295E 00	1.61061E-02	2.84279E-03	1.74628E-02	2.60040E-03	1.59739E-02
2.18943E-03	1.34493E-02	9.62856E-04	5.91468E-03				

COLUMN NO. = 12

1.94165E-03	1.19273E-02	4.13259E-03	2.53860E-02	6.70754E-03	4.12035E-02	1.00531E-02	6.17546E-02
1.45761E-02	8.95513E-02	1.95576E-02	1.12014E 00	2.20855E-02	1.35656E-01	2.02025E-02	1.24101E-01
1.70095E-02	1.04487E-01	7.48034E-03	4.59507E-02				

COLUMN NO. = 13

1.18465E-03	7.27635E-03	2.59455E-03	1.59379E-02	4.05349E-03	2.49000E-02	5.70454E-03	3.50422E-02
7.23893E-03	4.44677E-02	6.67276E-03	4.09898E-02	1.00606E 00	3.72265E-02	5.54330E-03	3.40517E-02
4.60732E-03	2.86707E-02	2.05254E-03	1.26084E-02				

COLUMN NO. = 14

2.14194E-03	1.31577E-02	4.62070E-03	2.83843E-02	7.60370E-03	4.67084E-02	1.16336E-02	7.14638E-02
1.73682E-02	1.06690E-01	2.43163E-02	1.49371E-01	3.30862E-02	1.20324E 00	3.40598E-02	2.09224E-01
2.86766E-02	1.76156E-01	1.26112E-02	7.74668E-02				

COLUMN NO. = 15

1.51034E-03	9.27783E-03	3.34770E-03	2.05644E-02	5.41408E-03	3.32560E-02	8.06075E-03	4.95161E-02

TABLE 37. D MATRIX (CONCL)

1.13541E-02	6.97464E-02	1.37395E-02	8.43999E-02	1.39081E-02	8.54357E-02	1.01064E 00	6.53865E-02
6.96201E-03	5.50524E-02	3.94135E-03	2.42111E-02				

COLUMN NO. = 16

2.34223E-03	1.43880E-02	5.10680E-03	3.13826E-02	8.49985E-03	5.22134E-02	1.32142E-02	8.11731E-02
2.01582E-02	1.23829E-01	2.90749E-02	1.78603E-01	4.10043E-02	2.51884E-01	4.83237E-02	1.29685E 00
4.63186E-02	2.84530E-01	2.03698E-02	1.25129E-01				

COLUMN NO. = 17

1.83583E-03	1.12773E-02	4.10065E-03	2.51909E-02	6.77465E-03	4.16157E-02	1.04169E-02	6.39897E-02
1.54691E-02	9.50248E-02	2.08062E-02	1.27809E-01	2.59045E-02	1.59128E-01	2.23062E-02	1.37024E-01
1.01718E 00	1.05519E-01	7.55417E-03	4.64042E-02				

COLUMN NO. = 18

2.54252E-03	1.56184E-02	5.59689E-03	3.43809E-02	9.39599E-03	5.77183E-02	1.47948E-02	9.08822E-02
2.29482E-02	1.40967E-01	3.38336E-02	2.07835E-01	4.89226E-02	3.00525E-01	5.99977E-02	3.68557E-01
6.65321E-02	1.40670E 00	3.05979E-02	1.87958E-01				

COLUMN NO. = 19

2.16133E-03	1.32767E-02	4.85399E-03	2.98174E-02	8.13521E-03	4.99734E-02	1.27731E-02	7.84634E-02
1.95842E-02	1.20303E-01	2.76728E-02	1.71216E-01	3.79007E-02	2.32819E-01	4.06582E-02	2.49757E-01
3.91696E-02	2.40613E-01	1.01578E 00	9.69287E-02				

COLUMN NO. = 20

2.74282E-03	1.68487E-02	6.08499E-03	3.73792E-02	1.02922E-02	6.32232E-02	1.63754E-02	1.00592E-01
2.57382E-02	1.58106E-01	3.85922E-02	2.37067E-01	5.68409E-02	3.49165E-01	7.16723E-02	4.40273E-01
8.22853E-02	5.05467E-01	4.26829E-02	1.26342E 00				

TABLE 38. SIC POINT LOAD MATRICES

RIGID LOAD DISTRIBUTIONS MATRIX

COLUMN NO. = 1

1.37247E-02	8.43090E-02	1.41184E-02	8.67276E-02	1.43996E-02	8.84549E-02	1.45716E-02	8.95110E-02
1.46769E-02	9.01581E-02	1.46681E-02	9.01042E-02	1.41471E-02	8.69033E-02	1.29409E-02	7.94941E-02
1.08956E-02	6.69298E-02	4.79156E-03	2.94339E-02				

COLUMN NO. = 2

6.06429E-02	1.03941E-01	6.55223E-02	1.11935E-01	5.22124E-02	8.91973E-02	3.34071E-02	5.70712E-02
2.41201E-02	4.12056E-02	1.90634E-02	3.26011E-02	1.41559E-02	2.41832E-02	9.80267E-03	1.67466E-02
6.21631E-03	1.06231E-02	2.26865E-03	3.87565E-03				

COLUMN NO. = 3

-1.46459E-01	-8.48935E-02	-8.69400E-02	-9.76126E-02	-4.70050E-02	-8.79693E-02	-4.76549E-02	-9.46477E-02
-3.69046E-02	-6.22426E-02	-2.33271E-02	-5.39662E-02	-2.31262E-02	-4.42578E-02	-1.69324E-02	-2.50835E-02
-1.13133E-02	-1.42246E-02	-3.09873E-03	-1.06612E-02				

FLEXIBLE LOAD DISTRIBUTIONS MATRIX

COLUMN NO. = 1

1.28919E-02	7.91941E-02	1.23937E-02	7.61332E-02	1.17445E-02	7.21452E-02	1.08516E-02	6.66600E-02
9.67186E-03	5.94123E-02	8.34712E-03	5.12742E-02	6.53835E-03	4.01637E-02	5.00009E-03	3.07143E-02
3.49570E-03	2.14735E-02	1.45095E-03	8.91317E-03				

COLUMN NO. = 2

[illegible]4236E-02	1.00752E-01	6.44600E-02	1.05416E-01	5.06620E-02	7.97967E-02	3.14734E-02	4.51934E-02
[illegible]759E-02	2.71731E-02	1.65692E-02	1.71558E-02	1.15729E-02	8.31571E-03	7.44344E-03	2.25262E-03
[illegible]726E-03	-1.34981E-03	1.42417E-03	-1.31199E-03				

COLUMN NO. = 3

-1.47816E-01	-8.09481E-02	-6.56031E-02	-8.94052E-02	-4.50197E-02	-7.57946E-02	-4.44244E-02	-7.66884E-02
-3.36948E-02	-4.21544E-02	-1.96003E-02	-3.10716E-02	-1.91684E-02	-1.99444E-02	-1.32631E-02	-2.54219E-03
-6.23814E-03	4.66624E-03	-1.73962E-03	-2.31222E-03				

Section IV

PROGRAM USAGE

GENERAL

The flexible airloads stand-alone program, BFCNTL, is designed to perform functions similar to the airloads module, BLCNTL, of SWEEP; that is, the program computes airloads on the airplane components for selected flight conditions. Punched card input variable data are generated by SWEEP. Operation of the program requires the user to prepare a program control factors card and to set up the program decks. Punched card output data are in a format that is compatible for use as an optional input to the SWEEP program.

PROGRAM DECK SETUP

The program deck setup is illustrated in Figures 6 and 7. The total deck setup must follow the blocked order shown. Twelve subordinate subroutines may be arranged in any order, but the total subroutine block must be immediately behind the main program deck. When only one case is to be run, the execute card must follow the last card of the DP data set.

When multiple cases are to be run, subsequent-case data must be arranged as shown in Figure 7 and placed immediately behind the first case. The execute card must then follow the last-case DP data termination card.

DATA INPUT DESCRIPTION

An ND control factors card must be provided for each case data block of a multiple-case computer run. It must be the first card of each case data block. The format of this card is discussed on page , and illustrated in Table 1.

Data set BC follows the ND card. Data set BF follows data set BC. After data sets BC and BF are read into core, subroutine RERDAT merges the data and forms a new BC data set. The initial BF data set is not disturbed. It is necessary, therefore, to repeat the entire input BC data set for each subsequent-case data block of a multiple-case computer run. Data sets DT, DB, DF, and DP follow data set BF in the order indicated in Figure 7.

All of the variables in data sets BC through DP are in the form to be read by subroutine DECRD. This subroutine and data card format are described in Section III. Data set BF for subsequent-case data blocks of a multiple-case computer run needs to contain only appropriate change variables with a DECRD termination punch in Column 1 of the last card in the data set, or a DECRD termination card if there are to be no changes. Data sets DT, DB, DF, and DP for subsequent-case data blocks require only the DECRD termination card for each set, since these data sets are read into core for the first case and remain undisturbed.

PROGRAM CONTROL FACTORS AND OPTIONS

The control of the program to obtain the user's desired options is accomplished by the input data contained on the ND control factors card. This card is prepared by the program user and must be prepared with a great deal of care to obtain desired output data.

A complete description of the data, locations by card column, and the options available are shown in Table 1. All of the variables in the list are in integer form and are entered in two-column fields. Single-character variables are entered in the second column of the field.

Factor ND(13) indentifies the air vehicle class. Factors ND(14) and ND(15) identify the wing type (fixed or variable sweep) and the vertical tail type (single, dual, or T-tail).

Factors ND(23) through ND(27) instruct the program to compute loads on selected airframe components or on all airframe components.

Factors ND(28) through ND(36) provide for the selection of the types of conditions to be computed. Figure 1 and Table 2 show the types of conditions that may be selected for each of the 11 case numbers available for entry in ND(46). Any condition type not specifically defined by the chosen case number, ND(46), will not be computed, even if the type factors ND(28) through ND(36) are entered as "yes."

Factor ND(40) is used to select or reject the punched card output. Since the primary purpose of the program is to obtain the punched output for use as an optional input to the SWEEP program, it would be expected that the user would always put a "yes" in ND(40). The factor ND(41) provides for a print-out listing of the data contained in the punched card output.

Factors ND(44) and ND(45) provide for the optional printout of FLXSIC and WFLEX matrices.

Factor ND(42) defines the number of stations and EI and GJ values that are used by subroutines FLXSIC and WFLEX to describe wing stiffness distribution. The ND(42) entry should always be 20.

Factor ND(43) defines the number of chordwise loads strips along the exposed wing which are used in the calculation of the aeroelastic loadings. The ND(43) entry should always be 10.

Card columns 7 through 20 and 49 through 54 should be left blank.

BC DATA SET USAGE

A complete description of input BC data set is presented in Table 3. All of the variables in the list of inputs are in the form to be read by subroutine DECRD. Expanded explanations for those variables which might be subject to misinterpretation are in the following paragraphs.

The following data locations need be entered only if a variable sweep wing in the forward position is to be analyzed. Applicable case numbers for this configuration are 8, 9, 10, 11, as indicated in Table 2.

BC(2)
BC(5)
BC(7)
BC(9)
BC(25) through BC(30)
BC(69) through BC(88)

If a fixed wing or a variable sweep wing in the aft position is to be analyzed, these input data locations may be eliminated or, preferably entered as zeros.

The following input data locations are not used for any input data and may be eliminated or, preferably entered as zeros.

BC(58) through BC(68)
BC(89) through BC(99)
BC(126) through BC(136)
BC(158) through BC(165)

A separate BC data set must be entered for each subsequent-case data block of a multiple-case computer run.

BF DATA SET USAGE

A complete description of input BF data set is presented in Table 4. All of the variables in the list of inputs are in the form to be read by subroutine DECRD. Expanded explanations for those variables which might be subject to misinterpretation are in the following paragraphs.

BF(2) and BF(25) through BF(46) data locations need be entered only if a variable sweep wing in the forward position is to be analyzed. The applicable case numbers for this configuration are 8, 9, 10, and 11, as indicated in Table 2.

If a fixed wing or a variable sweep wing in the aft position is to be analyzed, these input data locations are eliminated or, preferably entered as zeros.

Data locations BF(5) through BF(14) and/or BF(27) through BF(36) contain the dead weights of the 10 chordwise strips along the exposed wing span, starting with the most inboard strip and ending with the most outboard strip as shown in Figure 2. Data locations BF(15) through BF(24) and/or BF(37) through BF(46) contain the corresponding chordwise (X/C) center-of-gravity values.

Stations along the elastic axis entered in BF(47) through BF(66), and the EI and GJ data entered in BF(67) through BF(86) and BF(87) through BF(106), should contain values for the body side station, a station slightly outboard of the body side, and a station at or near the tip. Inclusion of these stations insures an accurate curve fit operation by subroutine CØDIM2. A maximum of 20 stations can be used.

SEMIPERMANENT DATA SETS

DT, DB, DF, and DP data sets contain all of the required aerodynamic data required to develop the lifting surface load distributions. These data are semipermanent (fixed data) and are the same as the data contained in the SWEEP program data bank. These data are described in Section III and in Tables 5 through 8. Data cards are in the format to be read by subroutine DECRD.

OUTPUT DATA DESCRIPTION

Primary output of the program is a deck of cards containing airplane component limit airloads, centers of pressure locations, and wing and empennage limit airload shears and moments at spanwise stations along the load reference line selected for weight analysis. The punched card output is a format for direct use as an on optional external airloads input to SWEEP. The printout of other data is also included for visual inspection of the results of final and intermediate calculations.

PUNCHED CARD OUTPUT

Output punched cards list the limit airload data in an E-format to be read by subroutine DECRD in SWEEP. A sample printout of the data contained on the punched cards is shown in Table 17. Each card contains a DECRD array index number, followed by five decimal data items and the card identification number. The output data array is described in Table 15. The index number punched on each card corresponds to the location within the array for the first item of decimal data on the card. A "yes" in ND control factor ND(40) will provide the punched output data deck.

Condition identification, the component loads identification, and the punched card identification numbers are assigned by the program and are included in the punched output deck for each condition. Component loads identification numbers also appear in the printed output. These identification numbers described and located under "Punched Card Output," in Section III.

PRINTED OUTPUT DATA

Refer to Section III for a detail description of the print options and the printed data output, including the data of primary interest, the intermediate-step and diagnostic data, and sample printouts.

Appendix A

PROGRAM FLOW CHARTS AND FORTRAN LISTINGS

FLOW CHART USAGE

The automatically generated computer program flow charts (AUTOFLOW) presented in this document include a table of contents, flow charts, and FORTRAN listings of all routines in the module. The 80-column card listings are sequenced and grouped by routine.

CROSS-REFERENCE LIST

The AUTOFLOW table of contents which precedes the flow charts and FORTRAN lists serves to cross reference the latter two. This table lists the following from left to right:

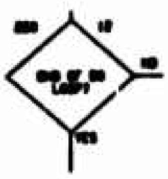
- The card identification from columns 73 through 80 of this card, or card sequence number. When sequence number is used in place of card identification, it is enclosed in parentheses.
- The page and box number where this card is displayed in a flow chart.
- The FORTRAN statement number from columns 1 through 5 of this card.
- The card identification(s) or sequence number(s) of the card(s) referring to this card (repeated as required).
- The pages and box numbers where the cards referring to this card are displayed in a flow chart (repeated as required).

FLOW CHARTS

The flow charts produced by AUTOFLOW use USASI conventional symbols. Since the flow charts are mechanically drawn from the program source deck, there are no omissions or vague generalizations about the processing within the boxes.

Every box on each page is uniquely numbered and may be referred to from elsewhere in the program. The source of a reference to a box will be indicated by showing the page and box number. If the number is followed by an asterisk, there are multiple references to this point, and the others may be found by using the cross-reference list.

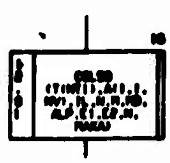
The most-often-used symbol is the decision box. Like all boxes, its box number is above and to the right of the box. Its FORTRAN statement number is above and to the left of the box. The decision choices for the paths are printed.



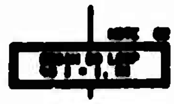
The unconditional transfer connecter has its page number destination printed above or to the left of the box number destination within the connecter. If there is a FORTRAN statement number at the destination, it is printed below the connecter.

The exit box example shows a connecter from page 9, box 15.

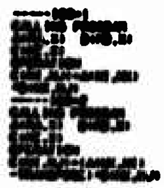
The subroutine call box includes the calling sequence. The page and box numbers of the flow chart of the called subroutine are shown on the left-hand side of the box. The page number is above the box number.



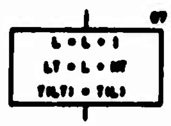
The note box encloses comments of a functional nature,



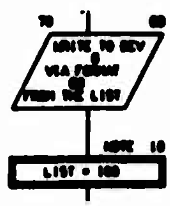
as differentiated from the 21 column comments, which are left justified without a box, that show the comment cards included in the FORTRAN deck.



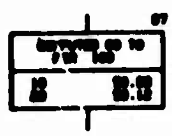
The process box is used to enclose FORTRAN arithmetic statements.



Input and output are shown as communicating with a device. The list used follows, if appropriate:



The computed GØ TØ becomes a branch table showing the page and box number of each of the ordered branches.



The column connecters and initial connecters are the only boxes without external box numbers. The function of the initial connecter is always clear, but the label given is the symbol in the next FORTRAN card, which is often blank.

The column connecter identifies the page and box number to which it connects.

DIRECTORY OF FLOW CHARTS AND FORTRAN LISTINGS

Program or Subroutine	Page Number for:	
	Flow Charts	Listings
Table of Contents and References	173	
BFCNTL	183	248
RERDAT	195	251
DECRD	200	253
USPANF	202	253
ATMØS	219	261
FCØDM2	221	262
CØDIM2	224	262
WFLEX	228	264
FLXSIC	231	265
GLSQ	235	267
MATRIT	237	267
BNLDSF	239	268
SPABMF	243	270

AUTOFLOW CHART SET

BFCNTL

05/04/73

CARD ID PAGE/BOX NAME REFERENCES (SOURCE SEQUENCE NO. AND PAGE/BOX)

FORTRAN MODULE FLEXIBLE AIRLOADS SA PROGRAM

CHART TITLE - INTRODUCTORY COMMENTS

CHART TITLE - PROCEDURES

BFCNT020	2.02	57										
BFCNT020	2.02		BFCNT020	2.03								
BFCNT032	2.06	1										
BFCNT032	2.05		BFCNT032	2.06								
BFCNT040	2.07	3	BFCNT900	11.22								
BFCNT077	3.03	5										
BFCNT077	3.03		BFCNT077	3.04								
BFCNT085	3.07	7	BFCNT085 BFCNT085	3.06 3.06	BFCNT085	3.06	BFCNT085	3.06	BFCNT085	3.06	BFCNT085	3.06
BFCNT100	3.08	8										
BFCNT105	3.09	9										
BFCNT115	3.10	11	BFCNT100	3.08	BFCNT105	3.09						
BFCNT120	3.11	12	BFCNT100	3.08								
BFCNT125	3.12	13	BFCNT105	3.09								
BFCNT110	3.14	10										
BFCNT130	3.15	14	BFCNT110	3.14								
BFCNT140	3.16	15	BFCNT110	3.14								
BFCNT150	3.17	16	BFCNT085 BFCNT110	3.06 3.14	BFCNT085	3.06	BFCNT085	3.06	BFCNT095	3.07	BFCNT130	3.13
BFCNT195	3.18	17										
BFCNT180	3.19	18										
BFCNT185	3.20	19										
BFCNT206	3.21	27	BFCNT150	3.17	BFCNT185	3.20	BFCNT178	3.27	BFCNT186	3.28		
BFCNT208	3.22	28										
BFCNT210	3.23	29										
BFCNT170	3.24	20	BFCNT195	3.18	BFCNT180	3.19						
BFCNT173	3.25	21	BFCNT195	3.18								
BFCNT176	3.26	22	BFCNT180	3.19								
BFCNT180	3.28	23	BFCNT185	3.20								
BFCNT183	3.29	24	BFCNT185	3.20								
BFCNT190	4.01	25	BFCNT085	3.06								
BFCNT188	4.02	26	BFCNT085	3.06								
BFCNT216	4.03	30	BFCNT208	3.22								
BFCNT220	4.04	31	BFCNT206	3.21	BFCNT213	3.23						
BFCNT223	4.05	32										
BFCNT226	4.06	33										
BFCNT230	4.07	35	BFCNT220	4.04	BFCNT228	4.08						
BFCNT240	4.08	36										
BFCNT230	4.09	34	BFCNT223	4.05								
BFCNT240	4.10	37	BFCNT130	3.13	BFCNT178	3.27						
BFCNT250	4.11	38										
BFCNT253	4.12	39										
BFCNT256	4.13	40	BFCNT250	4.11								
BFCNT258	4.14	41	BFCNT250	4.11								
BFCNT260	4.15	42	BFCNT253	4.12								
BFCNT266	4.16	43	BFCNT240	4.10								
BFCNT268	4.17	44										
BFCNT270	4.18	45										
BFCNT273	5.01	46	BFCNT268	4.17								
BFCNT276	5.02	47	BFCNT268	4.17								
BFCNT278	5.03	48	BFCNT270	4.18								
BFCNT285	5.04	50	BFCNT193 BFCNT253	4.01 4.12	BFCNT200 BFCNT266	4.02 4.16	BFCNT230 BFCNT270	4.07 4.18	BFCNT243	4.08	BFCNT233	4.09
BFCNT310	5.06		BFCNT710	11.22								
BFCNT312	5.07	60										
BFCNT314	5.08	2										
BFCNT314	5.08		BFCNT314	5.09								
BFCNT322	5.12	61	BFCNT316	5.10								
BFCNT330	5.14	62										
BFCNT334	5.15	63	BFCNT328	5.13								
BFCNT342	6.01	64	BFCNT316	5.10								
BFCNT350	6.02	65	BFCNT332	5.14	BFCNT336	5.15						
BFCNT364	6.04	66										
BFCNT368	6.05	67	BFCNT362	6.03								
BFCNT374	6.06	68	BFCNT316	5.10	BFCNT316	5.10	BFCNT316	5.10	BFCNT316	5.10	BFCNT394	7.01
BFCNT378	5.07	69	BFCNT316	5.10	BFCNT316	5.10	BFCNT316	5.10	BFCNT316	5.10	BFCNT396	7.02

CARD ID	PAGE/BOX	NAME	REFERENCES (SOURCE SEQUENCE NO. AND PAGE/BOX)
BFCNT382	6.08	70	BFCNT316 5.10 BFCNT316 5.10 BFCNT316 5.10 BFCNT316 5.10 BFCNT398 7.03
BFCNT386	6.09	71	BFCNT316 5.10 BFCNT316 5.10 BFCNT408 7.05
BFCNT388	6.10	72	BFCNT316 5.10 BFCNT316 5.10 BFCNT410 7.06
BFCNT394	7.01	73	BFCNT316 5.10 BFCNT316 5.10 BFCNT316 5.10
BFCNT396	7.02	74	
BFCNT398	7.03	75	BFCNT394 7.01
BFCNT402	7.04	76	BFCNT396 7.02 BFCNT398 7.03
BFCNT408	7.05	77	BFCNT316 5.10 BFCNT316 5.10
BFCNT410	7.06	78	
BFCNT414	7.07	79	BFCNT410 7.06
BFCNT420	7.08	80	BFCNT376 6.06 BFCNT380 6.07 BFCNT384 6.08 BFCNT388 6.09 BFCNT392 6.10
BFCNT424	7.09	81	BFCNT420 7.08
BFCNT428	7.10	82	BFCNT420 7.08
BFCNT432	7.11	83	BFCNT420 7.08
BFCNT436	7.12	84	BFCNT420 7.08
BFCNT440	7.13	85	BFCNT420 7.08
BFCNT444	8.01	86	BFCNT420 7.08
BFCNT448	8.02	87	BFCNT420 7.08
BFCNT452	8.03	88	BFCNT420 7.08
BFCNT456	8.04	89	BFCNT420 7.08
BFCNT460	8.05	90	BFCNT406 7.04 BFCNT410 7.07 BFCNT426 7.09 BFCNT430 7.10 BFCNT434 7.11 BFCNT438 7.12 BFCNT442 7.13 BFCNT446 8.01 BFCNT450 8.02 BFCNT454 8.03
BFCNT466	8.07	91	
BFCNT468	8.08	92	BFCNT480 8.10
BFCNT476	8.09	93	BFCNT464 8.06
BFCNT478	8.10	94	
BFCNT482	8.11	95	BFCNT476 8.09
BFCNT490	8.12	96	BFCNT474 8.08
BFCNT494	8.14	97	
BFCNT495	8.15	6	
BFCNT498	8.17	98	BFCNT493 8.13 BFCNT496 8.16 BFCNT496 8.16
BFCNT502	8.18	99	BFCNT494 8.14 BFCNT498 8.18 BFCNT496 8.16
BFCNT506	8.19	100	BFCNT493 8.13 BFCNT494 8.14 BFCNT496 8.16 BFCNT496 8.16 BFCNT496 8.16 BFCNT496 8.16 BFCNT500 8.17
BFCNT510	8.20	101	BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19
BFCNT512	8.21	102	
BFCNT516	9.01	103	BFCNT510 8.20
BFCNT520	9.02	105	BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19
BFCNT526	9.03	107	BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19
BFCNT532	9.04	109	BFCNT506 8.19 BFCNT506 8.19 BFCNT506 8.19
BFCNT534	9.05	110	
BFCNT538	9.06	111	BFCNT532 9.04
BFCNT540	9.07	112	BFCNT358 6.04 BFCNT370 6.05 BFCNT420 7.08 BFCNT420 7.08 BFCNT506 8.19 BFCNT506 8.19 BFCNT514 8.21 BFCNT518 9.01 BFCNT522 9.02 BFCNT528 9.03 BFCNT538 9.05
BFCNT568	9.09	120	BFCNT584 9.08
BFCNT570	10.01	117	BFCNT584 9.08
BFCNT572	10.02	129	BFCNT568 9.09
BFCNT582	10.06		BFCNT584 10.08
BFCNT584	10.07	90	
BFCNT588	10.10	118	BFCNT568 9.09 BFCNT570 10.04
BFCNT594	10.13	119	BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11
BFCNT600	10.14	121	BFCNT590 10.11 BFCNT590 10.11
BFCNT604	10.15	122	BFCNT590 10.11 BFCNT590 10.11
BFCNT608	10.16	123	BFCNT590 10.11
BFCNT612	10.17	124	BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11
BFCNT616	11.01	125	BFCNT590 10.11 BFCNT590 10.11 BFCNT590 10.11
BFCNT618	11.02	126	BFCNT596 10.13 BFCNT602 10.14 BFCNT606 10.15 BFCNT610 10.16 BFCNT614 10.17
BFCNT630	11.05	49	
BFCNT645	11.07		BFCNT660 11.11
BFCNT660	11.10	91	
BFCNT665	11.12	56	BFCNT625 11.04
BFCNT670	11.13	52	
BFCNT685	11.16		BFCNT700 11.20
BFCNT700	11.19	95	
BFCNT710	11.22	127	BFCNT310 5.06 BFCNT665 11.12

CHART TITLE - NON-PROCEDURAL STATEMENTS

CHART TITLE - SUBROUTINE RERDAT

RERDA005	13.01	RERDAT	BFCNT045 2.10-X USPF1200 26.21-X

CARD ID	PAGE/BOX	NAME	REFERENCES (SOURCE SEQUENCE NO. AND PAGE/BOX)
RERDA030	13.02	1	
RERDA040	13.11	2	
RERDA040	13.11		RERDA040 13.14
RERDA385	13.12	26	RERDA027 13.01
RERDA380	13.13	27	
RERDA060	13.16	3	
RERDA060	13.16		RERDA065 13.17
RERDA063	13.19		RERDA080 13.21
RERDA080	13.20	4	
RERDA090	13.24	5	
RERDA090	13.24		RERDA090 13.25
RERDA095	14.02	6	
RERDA095	14.02		RERDA095 14.03
RERDA110	14.06	7	
RERDA110	14.06		RERDA110 14.07
RERDA120	14.09	8	
RERDA120	14.08		RERDA120 14.10
RERDA130	14.12	9	
RERDA135	14.13	10	
RERDA135	14.13		RERDA135 14.14
RERDA145	14.15	11	RERDA125 14.11
RERDA150	14.16	12	
RERDA150	14.16		RERDA150 14.17
RERDA165	14.20	13	
RERDA165	14.20		RERDA165 14.21
RERDA175	14.23	14	
RERDA175	14.23		RERDA175 14.24
RERDA205	14.27	15	RERDA140 14.14
RERDA210	15.01	16	
RERDA210	15.01		RERDA210 15.02
RERDA214	15.04		RERDA216 15.06
RERDA216	15.05	17	
RERDA235	15.09	18	
RERDA235	15.09		RERDA235 15.10
RERDA270	15.14	19	
RERDA270	15.14		RERDA270 15.15
RERDA270	15.17		RERDA280 15.19
RERDA280	15.18	20	
RERDA290	15.21	21	
RERDA295	15.22	22	
RERDA295	15.22		RERDA295 15.23
RERDA305	15.24	23	RERDA285 15.20
RERDA330	15.28	24	RERDA300 15.23
RERDA340	15.28	25	
RERDA340	15.28		RERDA340 15.29
RERDA375	16.01	28	RERDA385 13.12
RERDA385	16.02	29	RERDA370 13.13
RERDA420	16.05		RERDA425 16.07
RERDA425	16.06	30	
RERDA440	16.10	31	
RERDA440	16.10		RERDA440 16.11
RERDA450	16.13		RERDA495 16.15
RERDA495	16.14	32	

CHART TITLE - NON-PROCEDURAL STATEMENTS

CHART TITLE - SUBROUTINE DECRO(V)

(000374)	18.01	5	(000382) 18.12 (000383) 18.15
(000374)	18.01	DECRO	BFCNT050 2.11-X BFCNT055 2.12-X BFCNT060 2.13-X BFCNT085 3.01-X RERDA030 13.02-X RERDA032 13.03-X
(000377)	18.04	21	
(000379)	18.05	22	(000376) 18.03
(000385)	18.06	7	(000379) 18.05
(000386)	18.07		(000391) 18.11
(000388)	18.09	11	
(000389)	18.10	3	(000387) 18.08
(000391)	18.11	2	(000388) 18.09
(000393)	18.13	6	
(000381)	18.14	8	(000379) 18.05

CHART TITLE - NON-PROCEDURAL STATEMENTS

CARD ID	PAGE/BOX	NAME	REFERENCES (SOURCE SEQUENCE NO. AND PAGE/BOX)				

CHART TITLE - SUBROUTINE USPANT

CARD ID	PAGE/BOX	NAME	REFERENCES				
USPF0002	20.01	USPANT	BFCNT575 10.03-X				
USPF0055	20.02	1					
USPF0055	20.02		USPF0058 20.03				
USPF0070	20.06	2					
USPF0075	20.07	3					
USPF0105	20.08	6	USPF0085 20.05				
USPF0110	20.09	7					
USPF0085	20.10	4	USPF0070 20.06				
USPF0095	20.11	5	USPF0080 20.07				
USPF0120	20.12	8	USPF0105 20.08				
USPF0125	20.13	9	USPF0115 20.09	USPF0100 20.11	USPF1005 20.10	USPF2375 32.31	USPF2305 33.08
USPF0135	20.14	10	USPF0125 20.13				
USPF0160	21.01	11	USPF0150 20.15				
USPF0166	21.02	12					
USPF0165	21.02		USPF0165 21.03				
USPF0185	21.06	13					
USPF0185	21.06		USPF0185 21.07				
USPF0200	21.08	14	USPF0150 20.15				
USPF0205	21.09	15					
USPF0205	21.09		USPF0205 21.10				
USPF0225	21.13	16					
USPF0225	21.13		USPF0225 21.14				
USPF0230	21 15	17	USPF0190 21.07				
USPF0260	21.16	18	USPF0125 20.13				
USPF0275	21.18	19	USPF0205 21.17				
USPF0300	21.20	20					
USPF0300	21.20		USPF0300 21.21				
USPF0325	21.24	21					
USPF0325	21.24		USPF0325 21.25				
USPF0345	22.01	22	USPF0285 21.17				
USPF0370	22.03	23					
USPF0370	22.03		USPF0370 22.04				
USPF0395	22.07	24					
USPFC395	22.07		USPF0395 22.08				
USPF0410	22.10	25	USPF0250 21.15	USPF0335 21.28			
USPF0420	22.11	26	USPF0410 22.10				
USPF0450	22.14		USPF0460 22.16				
USPF0460	22.15	27					
USPF0500	22.22	30	USPF0490 22.21				
USPF0520	22.24	32	USPF0490 22.21				
USPF0540	22.26	34	USPF0490 22.21				
USPF0560	22.28	36	USPF0535 22.25				
USPF0570	22 29	37	USPF0515 22.23				
USPF0580	22.31		USPF0590 22.33				
USPF0590	22.32	38					
USPF0600	23.01	44	USPF0685 23.12				
USPF0605	23.02	39	USPF0410 22.10				
USPF0630	23.05		USPF0640 23.07				
USPF0640	23.06	40					
USPF0690	23.13	45	USPF0685 23.12				
USPF0695	23 14	46	USPF0595 22.33	USPF0605 23.01	USPF0675 23.21		
USPF0720	23.17	48	USPF0745 23.20				
USPF0670	23.21	43					
USPF0755	24.01	50	USPF0745 23.20				
USPF0760	24.02		USPF0765 24.04				
USPF0785	24.03	51					
USPF0780	24.07	52					
USPF0790	24.09	53					
USPF0790	24.09		USPF0790 24.10				
USPF0805	24.12	54	USPF0775 24.08				
USPF0825	24.13	55	USPF0800 24.11				
USPF0855	24.18	58	USPF0845 24.17				
USPF0880	24.20	59					
USPF0880	24.20		USPF0880 24.21				
USPF0900	24.24	60					
USPF0900	24.24		USPF0900 24.25				
USPF0920	24.28		USPF0925 24.30				
USPF0925	24.29	61					
USPF0950	24.33	62					

CARD ID	PAGE/BOX	NAME	REFERENCES (SOURCE SEQUENCE NO. AND PAGE/BOX)		
USPF0950	24.33		USPF0950 24.34		
USPF0965	25.01	63	USPF0955 24.35		
USPF0975	25.02	64	USPF0955 24.35		
USPF0987	25.04		USPF0985 25.06		
USPF0985	25.05	65			
USPF1025	25.10		USPF1035 25.16		
USPF1035	25.14	68			
USPF1080	25.19		USPF1085 25.21		
USPF1085	25.20	70			
USPF1095	25.23	71			
USPF1095	25.23		USPF1095 25.24		
USPF1113	25.27		USPF1120 25.29		
USPF1120	25.28	72			
USPF1135	25.31	73			
USPF1145	26.01	74	USPF1130 25.30		
USPF1146	26.02	75	USPF1140 25.31		
USPF1148	26.04		USPF1149 26.06		
USPF1149	26.05	106			
USPF1155	26.08		USPF1170 26.10		
USPF1170	26.09	76			
USPF1190	26.14	108			
USPF1192	26.15	110	USPF1188 26.13		
USPF1194	26.16		USPF1196 26.17		
USPF1196	26.17	112			
USPF1202	26.19	102	USPF1190 26.14	USPF1194 26.16	
USPF1204	26.20	103	USPF1200 26.18		
USPF1235	26.25		USPF1250 26.28		
USPF1250	26.27	77			
USPF1285	26.31	78	USPF1080 28.09		
USPF1290	26.32	79	USPF1285 26.31		
USPF1303	26.34		USPF1305 26.36		
USPF1305	26.35	80			
USPF1315	27.01	81	USPF1285 26.31		
USPF1327	27.03		USPF1330 27.05		
USPF1330	27.04	82			
USPF1340	27.06	83	USPF1285 26.31		
USPF1343	27.07		USPB1345 27.09		
USPB1345	27.08	84			
USPF1355	27.10	85	USPF1285 26.31		
USPF1357	27.11		USPF1360 27.13		
USPF1360	27.12	86			
USPF1365	27.14	87	USPF1350 27.09		
USPF1380	27.15	88	USPF1310 26.36	USPF1335 27.05	
USPF1397	27.18		USPF1420 27.21		
USPF1420	27.20	89			
USPF1495	27.25		USPF1485 27.28		
USPF1460	27.26	90			
USPF1475	27.27	91	USPF1455 27.25		
USPF1485	27.28	92	USPF1470 27.26		
USPF1505	27.31	94	USPF1500 27.30		
USPF1520	28.01	96	USPF1500 27.30		
USPF1535	28.02	98	USPF1500 27.30		
USPF1550	28.03	100	USPF1500 27.30		
USPF1560	28.04	102	USPF1515 27.31	USPF1530 28.01	USPF1545 28.02
USPF1600	28.10	105	USPF1595 28.09		
USPF1625	28.11	107	USPF1585 28.08		
USPF1650	28.12	109	USPF1595 28.08		
USPF1670	28.13	111	USPF1595 28.09		
USPF1685	28.14	113	USPF1620 28.10	USPF1645 28.11	USPF1665 28.12
USPF1695	28.16	114			
USPF1695	28.16		USPF1695 28.17		
USPF1730	28.21		USPF1750 28.24		
USPF1750	28.23	115			
USPF1760	28.26	116			
USPF1770	29.01	117	USPF1755 28.25		
USPF1780	29.02	118	USPF1765 28.26		
USPF1865	29.10	119			
USPF1875	29.11	120	USPF0845 24.17		
USPF1880	29.12		USPF1920 30.04		
USPF1890	29.13	121	USPF1880 29.12		
USPF1905	30.01	122	USPF1880 29.12		
USPF1910	30.02	123	USPF1895 29.13		

CARD ID	PAGE/BOX	NAME	REFERENCES (SOURCE SEQUENCE NO. AND PAGE/BOX)		
USPF1920	30.03 124				
USPF1940	30.07 126				
USPF1950	30.08 127		USPF1935 30.06		
USPF1955	30.09 128		USPF1945 30.07		
USPF1975	30.13 129				
USPF1976	30.13		USPF1978 30.14		
USPF1980	31.01 130		USPF1980 30.15		
USPF1985	31.02 131				
USPF2005	31.03 132		USPF1990 31.01		
USPF2015	31.04 133		USPF1980 30.15	USPF2000 31.02	
USPF2050	31.08 134				
USPF2060	31.09 135		USPF2045 31.07		
USPF2070	31.10 136		USPF2055 31.08		
USPF2080	31.12		USPF2120 32.02		
USPF2095	31.14 137		USPF2085 31.13		
USPF2110	32.01 138		USPF2085 31.13		
USPF2120	32.02 139		USPF2100 31.14		
USPF2155	32.07		USPF2215 32.14		
USPF2160	32.08 142				
USPF2170	32.09 143		USPF2155 32.07		
USPF2180	32.10 144		USPF2185 32.08		
USPF2215	32.13 145				
USPF2235	32.16 146				
USPF2250	32.17 147		USPF2230 32.15		
USPF2285	32.18 148		USPF2245 32.16		
USPF2315	32.23 149				
USPF2335	32.26 150		USPF2310 32.22		
USPF2356	32.28 151		USPF2330 32.25		
USPF2360	32.29 152				
USPF2365	32.30 153		USPF2330 32.25	USPF2355 32.28	
USPF2370	32.31 154				
USPF2545	33.01 169		USPF2400 33.12	USPF2535 34.14	
USPF2555	33.04		USPF2560 33.07		
USPF2560	33.05 170				
USPF2380	33.09 155		USPF2365 32.30		
USPF2390	33.10 156		USPF2350 32.27	USPF2360 32.29	
USPF2395	33.11 157				
USPF2400	33.12 158		USPF2535 34.14		
USPF2405	33.13 159		USPF2505 33.08		
USPF2415	33.14 160		USPF1885 29.10	USPF2390 33.10	USPF2395 33.11
USPF2420	33.15		USPF2525 34.12		
USPF2425	33.16 161		USPF2420 33.15		
USPF2445	33.19 162		USPF2420 33.15		
USPF2465	33.22 163		USPF2420 33.15		
USPF2485	34.01 164		USPF2420 33.15		
USPF2500	34.04 165		USPF2440 33.18	USPF2460 33.21	USPF2480 33.24
USPF2515	34.08		USPF2520 34.11		
USPF2520	34.09 166				
USPF2525	34.12 167				
USPF2535	34.14 168				
USPF2575	34.15 171		USPF2505 33.08	USPF2405 33.13	
USPF2585	34.18		USPF2580 34.21		
USPF2580	34.19 172				
USPF9040	34.22 181		USPF2405 33.13	USPF2530 34.13	

CHART TITLE - NON-PROCEDURAL STATEMENTS

CHART TITLE - SUBROUTINE ATMOS(H,RHOH,PH,AH)

ATM00020	37.01	ATMOS	USPF1100 26.11-X		
00000130	37.04	38			
00000170	37.05	40	00000120 37.03		
00000180	37.06	45			
00000210	37.07	50	00000170 37.05		
00000220	37.08	55			
00000260	37.09	60	00000210 37.07		
00000270	37.10	65			
00000300	38.01	70	00000260 37.09		
00000310	38.02	75			
00000350	38.03	80	00000300 38.01		
00000380	38.04	100	00000160 37.04	00000250 37.08	00000340 38.02
00000450	38.06	110	00000200 37.06	00000290 37.10	00000370 38.03

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CARD ID    PAGE/BOX   NAME                     REFERENCES  (SOURCE SEQUENCE NO. AND PAGE/BOX)

(001010)   30.00  120        00000440  30.05

CHART TITLE - FUNCTION  FCOOM2(X,Y,X1,Y1,Z1,N1,N2,XK)

FCOD0095   30.02  100
FCOD0100   30.03  110
FCOD0115   30.04  120        FCOD0095  30.02
FCOD0125   30.05  125        FCOD0135  30.07
FCOD0130   30.06  130
FCOD0140   30.08  150        FCOD0125  30.05
FCOD0145   30.09  155
FCOD0155   30.10  160        FCOD0140  30.08
FCOD0160   30.11  165        FCOD0135  30.07
FCOD0170   40.01  170        FCOD0155  30.10
FCOD0175   40.02  200        FCOD0110  30.03    FCOD0150  30.09    FCOD0165  30.11
FCOD0180   40.03             FCOD0195  40.05
FCOD0185   40.04  300

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - FUNCTION  CODIM2(X,XI,YI,N,XK)

COD10045   42.01  110        COD10030  42.04    COD10115  42.14
COD10050   42.02  140        COD10110  42.13
COD10035   42.05  105        COD10085  42.08
COD10065   42.06  150        COD10030  42.04
COD10070   42.07  165
COD10075   42.08             COD10080  42.09
COD10080   42.09  170
COD10090   42.10  175        COD10065  42.06
COD10095   42.11             COD10100  42.12
COD10100   42.12  180
COD10105   42.13  185        COD10085  42.09    COD10145  43.02
COD10115   42.14  190        COD10075  42.08    COD10095  42.11
COD10120   42.15  210
COD10135   43.01  220        COD10075  42.08    COD10095  42.11
COD10145   43.02  260        COD10115  42.14
COD10150   43.03  265
COD10165   43.04  280        COD10145  43.02
COD10170   43.05  285        COD10130  42.15    COD10160  43.03
COD10175   43.06  290
COD10180   43.07  295        COD10170  43.05
COD10255   43.12  305
COD10265   43.13  310        COD10250  43.11
COD10300   43.15  315        COD10260  43.12
COD10305   43.16  320        COD10300  43.15
COD10330   44.01  330        COD10300  43.15
COD10350   44.03  350        COD10300  43.15    COD10325  43.16
COD10365   44.05  400
COD10375   44.06  410        COD10360  44.04
COD10385   44.07  900        COD10060  42.02    COD10040  42.05    COD10140  43.01    COD10370  44.05

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - SUBROUTINE  WFLEX(AFW,AFWCP,AFWF,AFWDF,F,YC(GJ,EI,GJ,CR,BO2,BLBS,A

WFLEX010   46.01  WFLEX      USPF1210  28.22-X
WFLEX192   46.05  40         WFLEX130  46.03
WFLEX220   46.07             WFLEX260  46.14
WFLEX230   46.08             WFLEX280  46.13
WFLEX260   46.09  65
WFLEX692   46.10  160        WFLEX050  46.01
WFLEX340   46.17             WFLEX390  46.22
WFLEX350   46.18             WFLEX380  46.20
WFLEX380   46.19  70
WFLEX390   46.21  80
WFLEX400   46.24  90
WFLEX402   46.25             WFLEX405  47.04
WFLEX404   46.26             WFLEX406  46.29
WFLEX406   46.27  92
WFLEX406   46.27             WFLEX408  46.28
WFLEX420   46.31             WFLEX430  46.34
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CARD ID   PAGE/BOX  NAME                 REFERENCES  (SOURCE SEQUENCE NO. AND PAGE/BOX)

WFLEX430  46.32  95
WFLEX430  46.32              WFLEX430  46.33
WFLEX496  47.01  100
WFLEX495  47.01              WFLEX495  47.02
WFLEX405  47.04  110
WFLEX830  47.12  112         WFLEX470  47.06
WFLEX840  47.13              WFLEX821  47.23
WFLEX850  47.14  114
WFLEX850  47.14              WFLEX850  47.15
WFLEX570  47.17              WFLEX810  47.20
WFLEX810  47.18  115
WFLEX821  47.22  117

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - SUBROUTINE  FLXSIC(SICBAR,YC(OJ,E1,OJ,CR,BO2,BLBS,ANGLE,FSLERT,AND

FSIC0040  49.01  FLXSIC      WFLEX150  46.04-X
FSIC0170  49.07  30          FSIC0125  49.01
FSIC0210  49.09              FSIC0290  49.13
FSIC0290  49.12  40
FSIC0300  49.16              FSIC0305  49.18
FSIC0305  49.18  50
FSIC0305  49.18              FSIC0302  49.17
FSIC0430  49.22  55          FSIC0307  49.20
FSIC0530  50.02  60          FSIC0425  49.21    FSIC0495  49.26
FSIC0540  50.03              FSIC0720  50.21
FSIC0580  50.06              FSIC0600  50.08
FSIC0600  50.07  70
FSIC0620  50.10              FSIC0720  50.20
FSIC0661  50.13              FSIC0660  50.10
FSIC0667  50.15  72
FSIC0670  50.16  74          FSIC0667  50.14
FSIC0690  50.17  75
FSIC0720  50.20  80
FSIC0850  50.27  82          FSIC0755  50.23
FSIC0860  50.28              FSIC0870  50.31
FSIC0870  50.29  85
FSIC0870  50.29              FSIC0870  50.30
FSIC0900  51.01              FSIC0950  51.03
FSIC0950  51.02  90
FSIC1000  51.05              FSIC1030  51.11
FSIC1010  51.06              FSIC1030  51.10
FSIC1030  51.08  100
FSIC1030  51.08              FSIC1030  51.09
FSIC1100  51.15  150         FSIC1005  51.12

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - SUBROUTINE  OLSQ(A,X,IL,N,M,ALPHA,E1,E2)

OLS00020  53.01  OLSQ        WFLEX480  47.03-X
OLS00035  53.03  60
OLS00035  53.03              OLS00035  53.04
OLS00050  53.07              OLS00125  53.19
OLS00060  53.09              OLS00105  53.16
OLS00065  53.10  6
OLS00085  53.12              OLS00095  53.14
OLS00095  53.13  5
OLS00105  53.16  4           OLS00060  53.09
OLS00115  53.18  8
OLS00125  53.19  3           OLS00110  53.17
OLS00145  53.22  35
OLS00145  53.22              OLS00145  53.23
OLS00155  53.25              OLS00190  53.32
OLS00160  53.26  31
OLS00180  53.28  32
OLS00180  53.28              OLS00180  53.29
OLS00190  53.31  30          OLS00195  53.25
OLS00200  53.34  51
OLS00210  53.35  50          OLS00195  53.33
OLS00220  53.36  52          OLS00205  53.34
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CARD ID   PAGE/BOX   NAME                    REFERENCES  (SOURCE SEQUENCE NO. AND PAGE/BOX)

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - SUBROUTINE  MATRIT(AMN,NR,NC,NRMAX,MTYPE,IPRIN,HEAD)

MRIT0030   95.01  MATRIT       MFLEX475  47.08-X   MFLEX470  47.09-X   MFLEX480  47.11-X   MFLEX628  47.24-X   MFLEX620  47.25-X
                               MFLEX632  47.26-X   MFLEX635  47.27-X   MFLEX670  47.28-X   FSIC0135  48.04-X   FSIC0137  48.05-X
                               FSIC0130  48.06-X   FSIC0430  48.22-X   FSIC0450  48.23-X   FSIC0460  48.24-X   FSIC0480  48.25-X
                               FSIC0780  50.24-X   FSIC0700  50.25-X   FSIC0800  50.26-X   FSIC1070  51.13-X   FSIC1080  51.14-X
MRIT0230   95.03  50           MRIT0150  95.02
MRIT0250   95.05  70
MRIT0250   95.05               MRIT0250  95.07
MRIT0270   95.08  80           MRIT0210  95.13
MRIT0170   95.09  10           MRIT0150  95.02
MRIT0180   95.10               MRIT0200  95.13
MRIT0200   95.11  30

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - SUBROUTINE  BNLOSF

BNLOF002   57.01  BNLOSF       BFCNT610  11.02-X
BNLOF035   57.03  1
BNLOF055   57.05  2
BNLOF055   57.05               BNLOF055  57.06
BNLOF085   57.07  3            BNLOF030  57.02
BNLOF085   57.08  4
BNLOF085   57.08               BNLOF085  57.10
BNLOF095   57.11  5            BNLOF060  57.06
BNLOF170   57.17  6
BNLOF185   57.18  7            BNLOF185  57.16
BNLOF200   57.19  8            BNLOF180  57.17
BNLOF340   58.08  9            BNLOF330  58.07     BNLOF310  58.07
BNLOF350   58.10  10
BNLOF360   58.11  11           BNLOF345  58.09
BNLOF370   58.12  12           BNLOF355  58.10
BNLOF400   58.15  13
BNLOF405   58.16  14
BNLOF405   58.16               BNLOF405  58.17
BNLOF407   58.18  15           BNLOF395  58.14
BNLOF480   59.01  16           BNLOF330  58.07
BNLOF500   59.03  17           BNLOF490  59.02
BNLOF505   59.04  18           BNLOF490  59.02
BNLOF530   59.06  19           BNLOF330  58.07
BNLOF545   59.07  20           BNLOF330  58.07
BNLOF565   59.09  21           BNLOF330  58.07     BNLOF520  59.05     BNLOF535  59.06
BNLOF570   59.10  22           BNLOF470  58.23
BNLOF575   59.11  23
BNLOF580   59.12  24           BNLOF570  59.10
BNLOF900   59.20  25           BNLOF575  59.11

CHART TITLE - NON-PROCEDURAL STATEMENTS


CHART TITLE - SUBROUTINE  SPABMF

SPABF002   61.01  SPABMF       BFCNT620  11.03-X
SPABF018   61.02  32
SPABF018   61.02               SPABF018  61.03
SPABF025   61.05  1
SPABF033   61.06  2            SPABF020  61.04     SPABF025  61.05
SPABF050   61.08  3
SPABF230   61.09  10           SPABF025  61.05     SPABF575  63.15
SPABF235   61.10  11
SPABF065   61.11  4            SPABF045  61.07
SPABF075   61.12  5            SPABF060  61.08
SPABF095   61.14               SPABF105  61.16
SPABF105   61.15  6
SPABF315   61.18  14           SPABF235  61.10     SPABF575  63.15
SPABF320   61.19  15
SPABF327   61.20  16           SPABF315  61.18     SPABF320  61.19
SPABF145   62.01  7            SPABF575  63.15
SPABF175   62.02  8            SPABF575  63.15
SPABF205   62.03  9            SPABF575  63.15
```

CHART TITLE - NON-PROCEDURAL STATEMENTS

CHART TITLE - INTRODUCTORY COMMENTS

BFCNTL IS THE STAND ALONE FLEXIBLE LOADS CONTROL PROGRAM.
DETERMINES BASIC AIRLOAD CONDITIONS TO BE COMPUTED FOR A SPECIFIED
SPEED-ALTITUDE CASE.
IT PROVIDES LOGIC AND CONTROL FOR THE AIRLOAD SUBROUTINES.

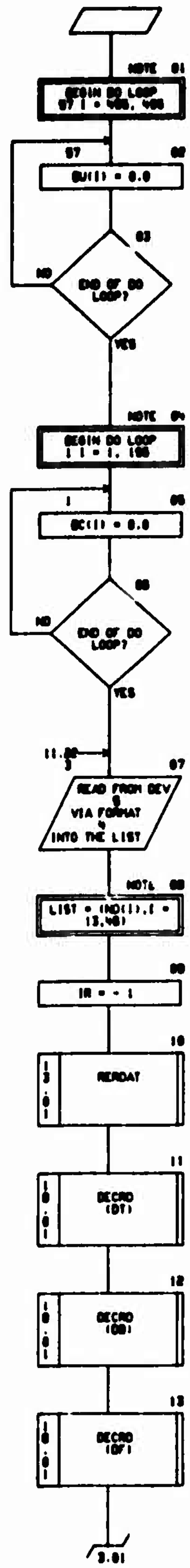

NOTE 01
BEGIN DO LOOP
BU(I) = 0.0
END OF DO LOOP?
NO
YES
NOTE 04
BEGIN DO LOOP
BC(I) = 0.0
END OF DO LOOP?
NO
YES
READ FROM DEV
VIA FORMAT
INTO THE LIST
NOTE 08
IR = - 1
AERDAT
DECRD (DT)
DECRD (DB)
DECRD (DF)
3.01

CHART TITLE - PROCEDURES

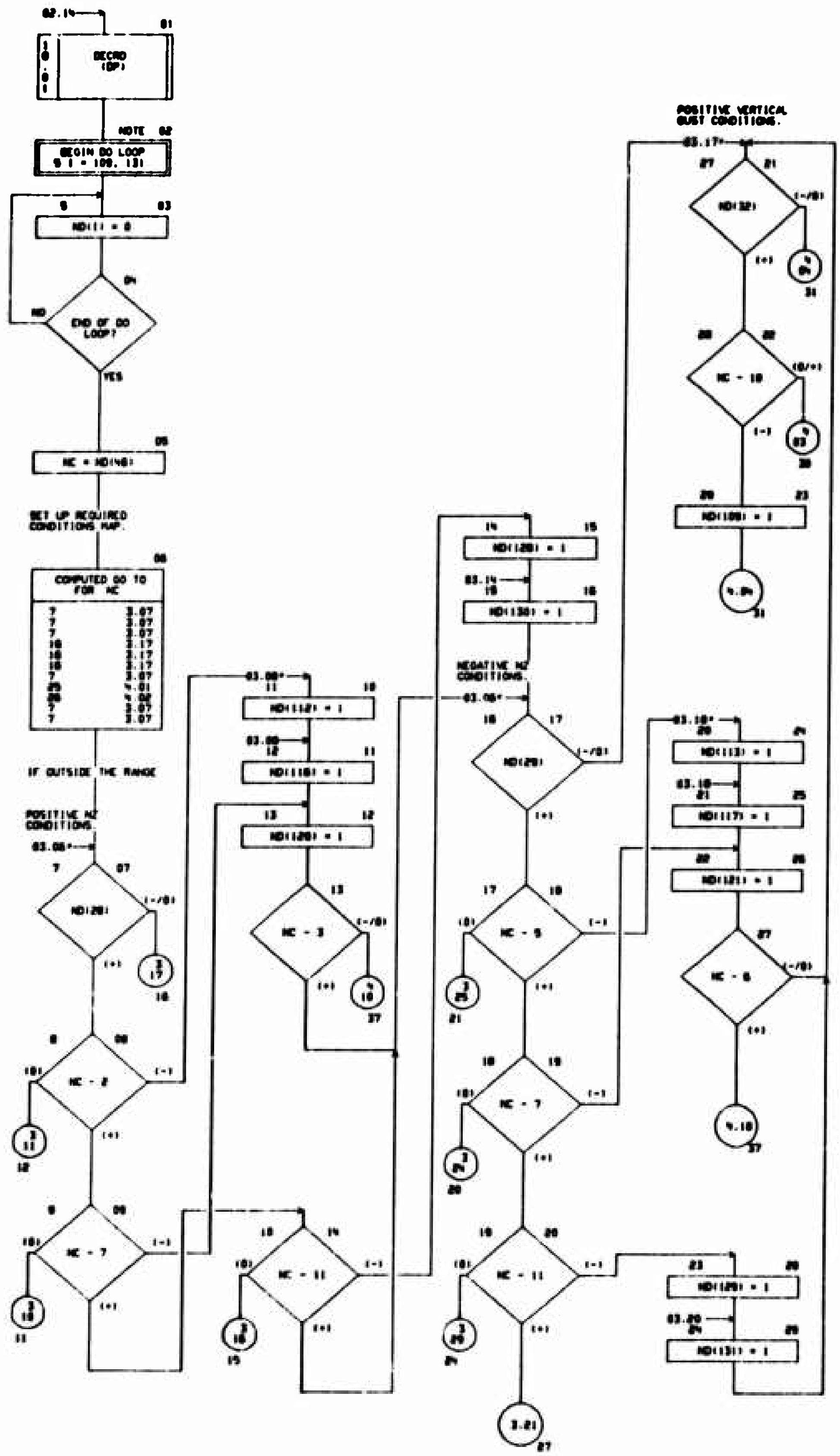


CHART TITLE - PROCEDURES

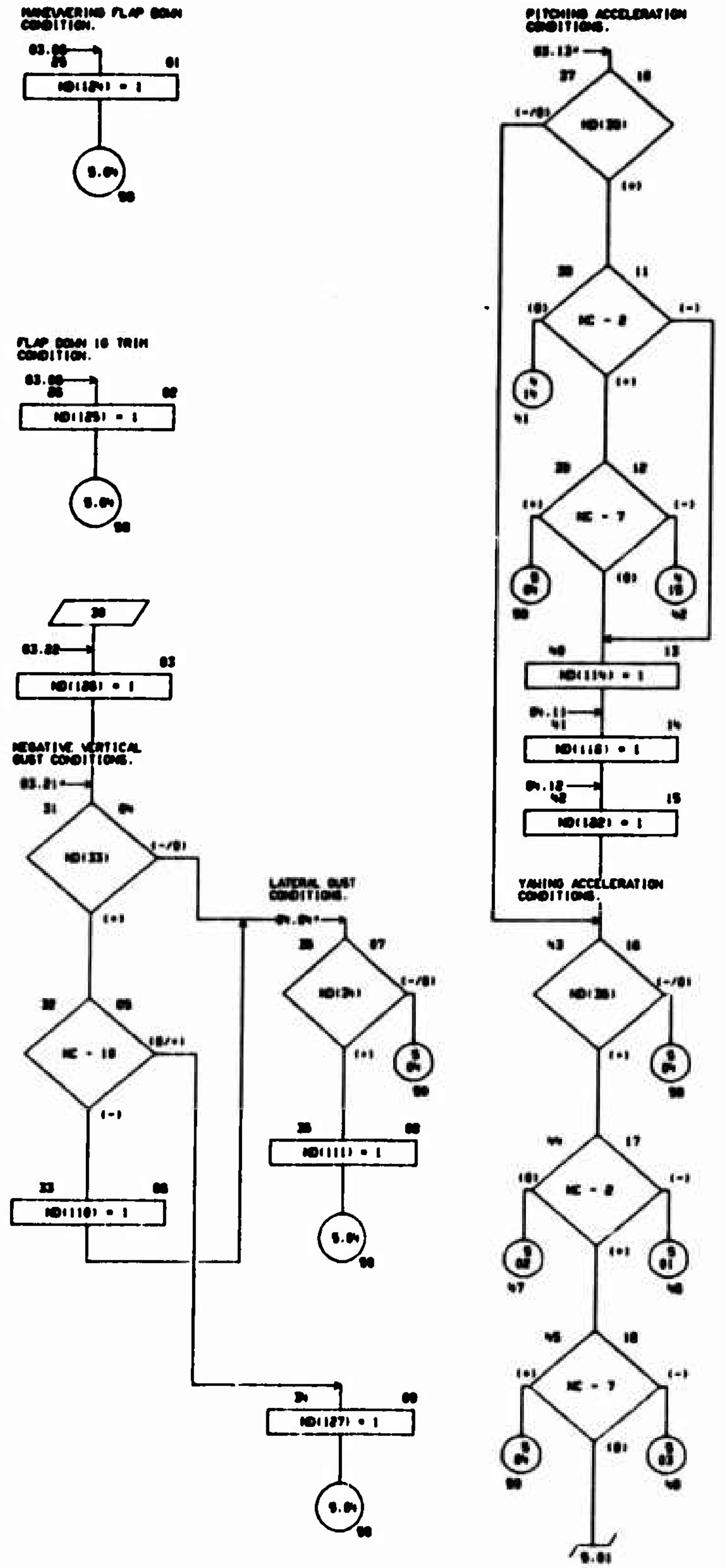
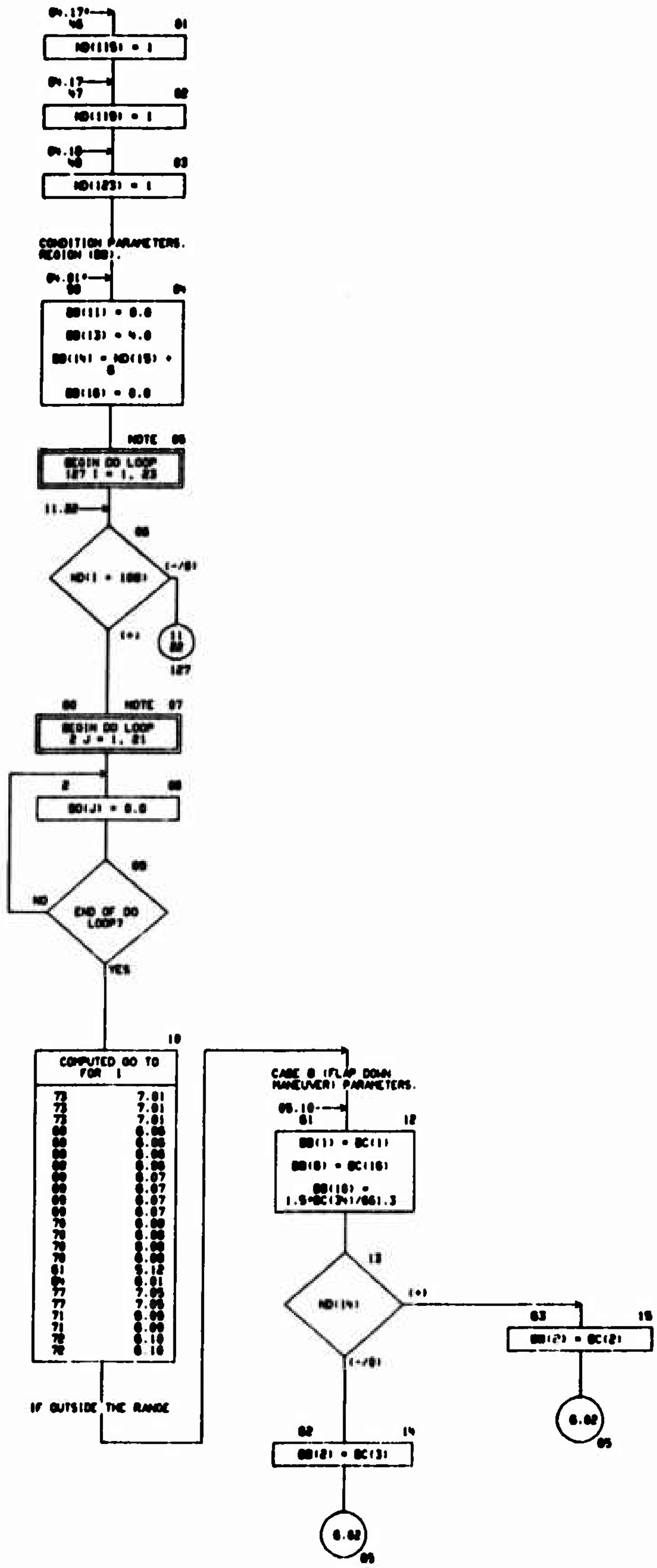


CHART TITLE - PROCEDURES



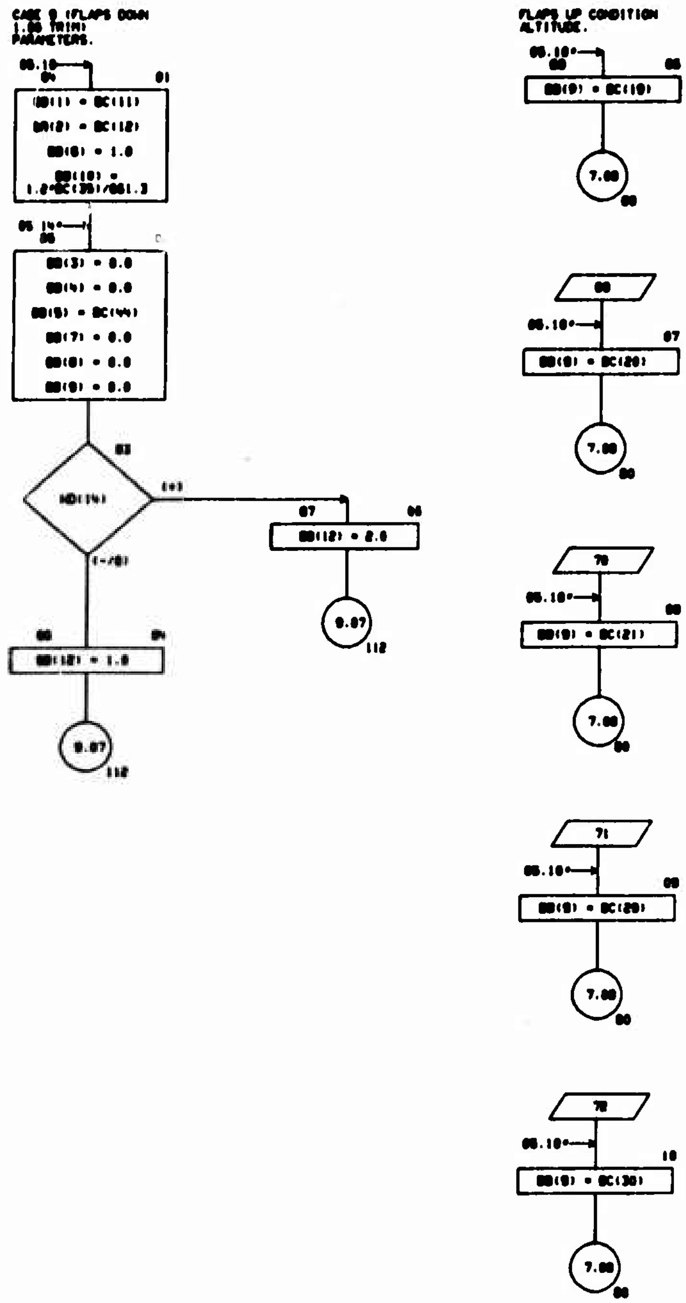

FLAPS UP CONDITION ALTITUDE.

CHART TITLE - PROCEDURES

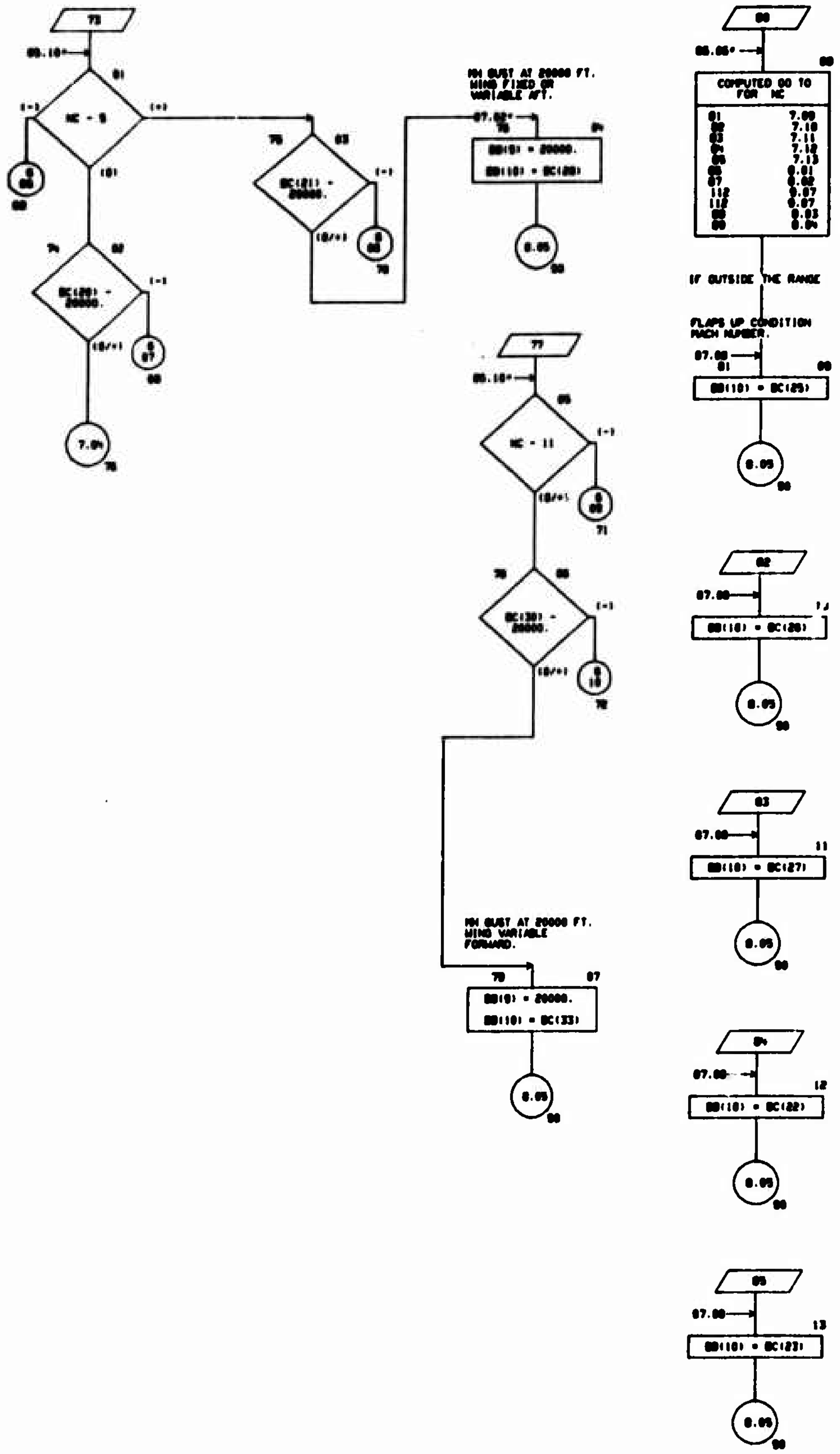


CHART TITLE - PROCEDURES

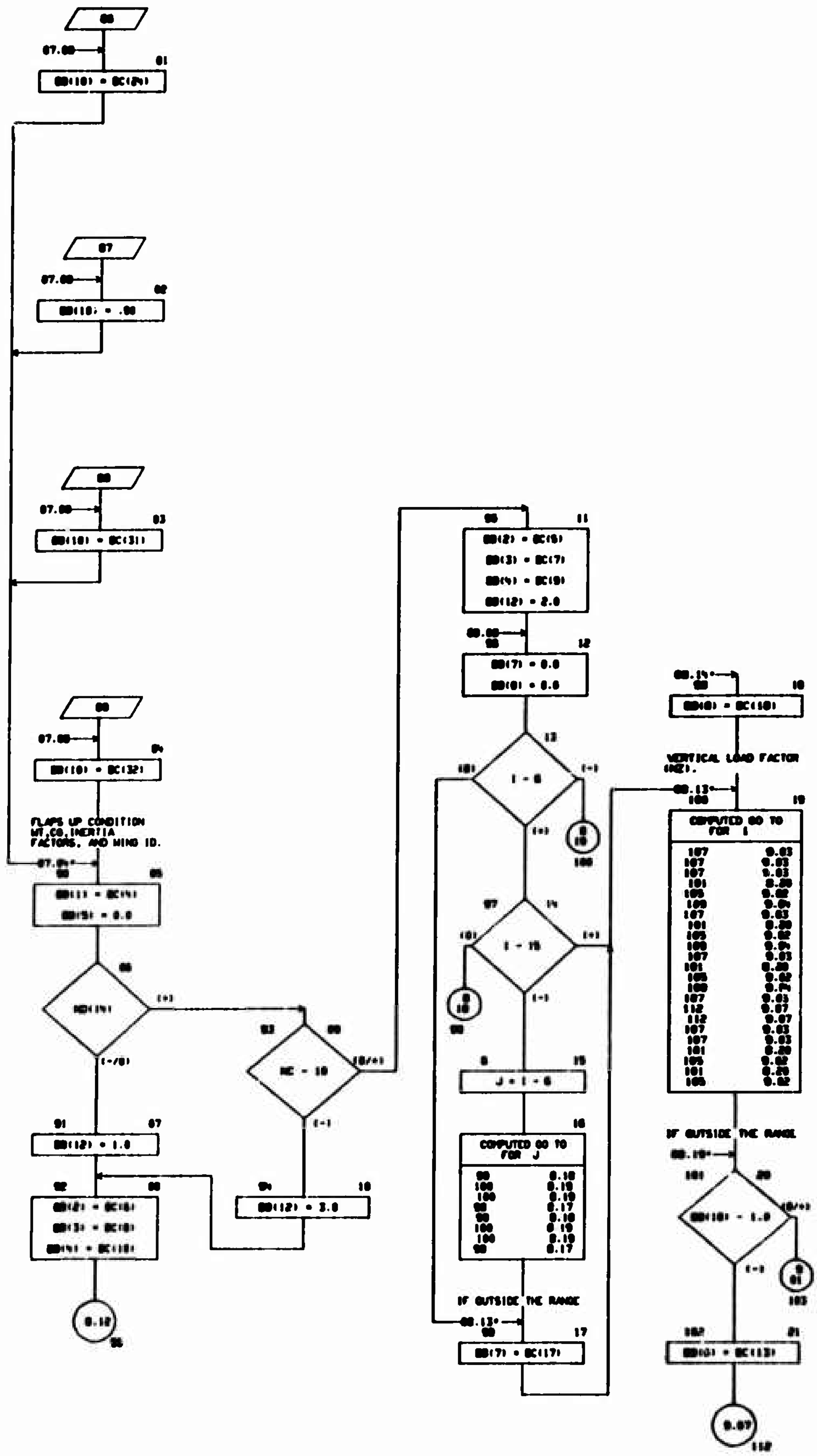


CHART TITLE - PROCEDURES

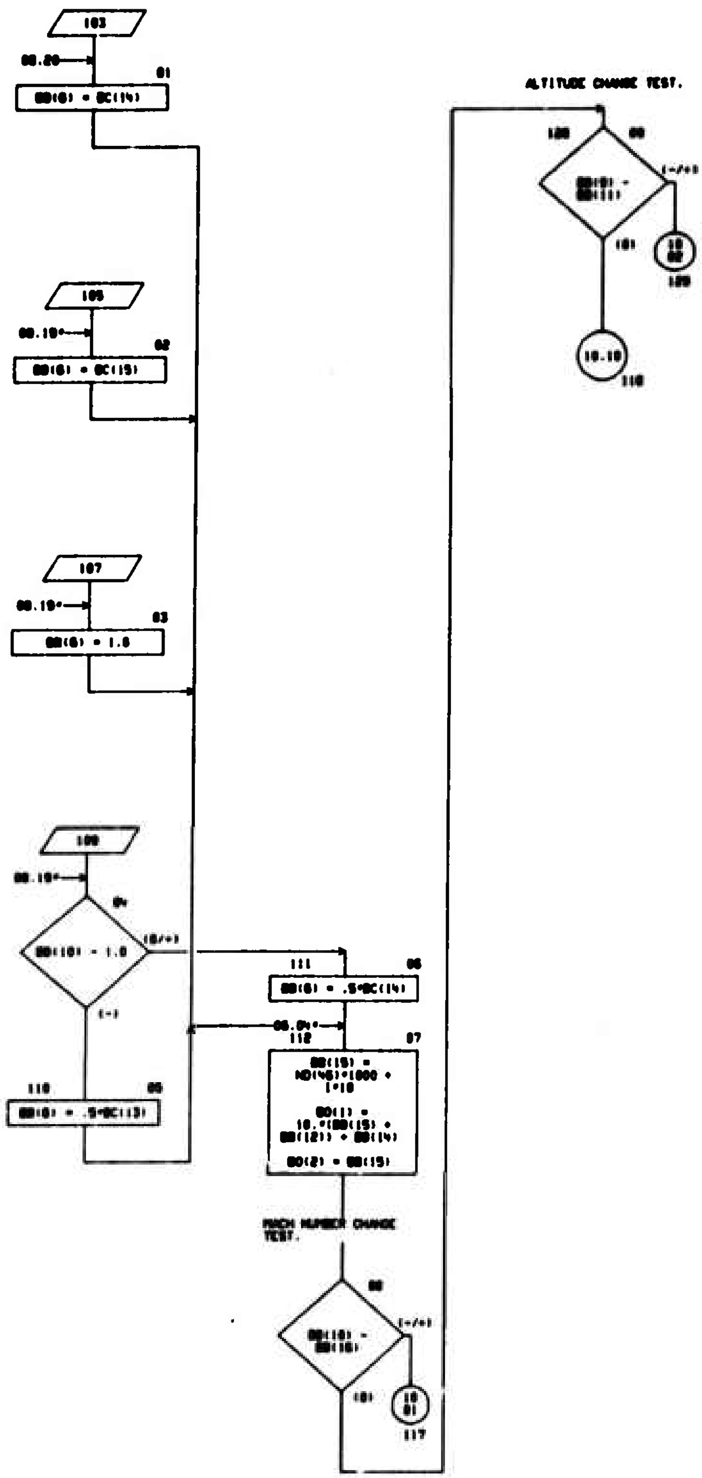


CHART TITLE - PROCEDURES

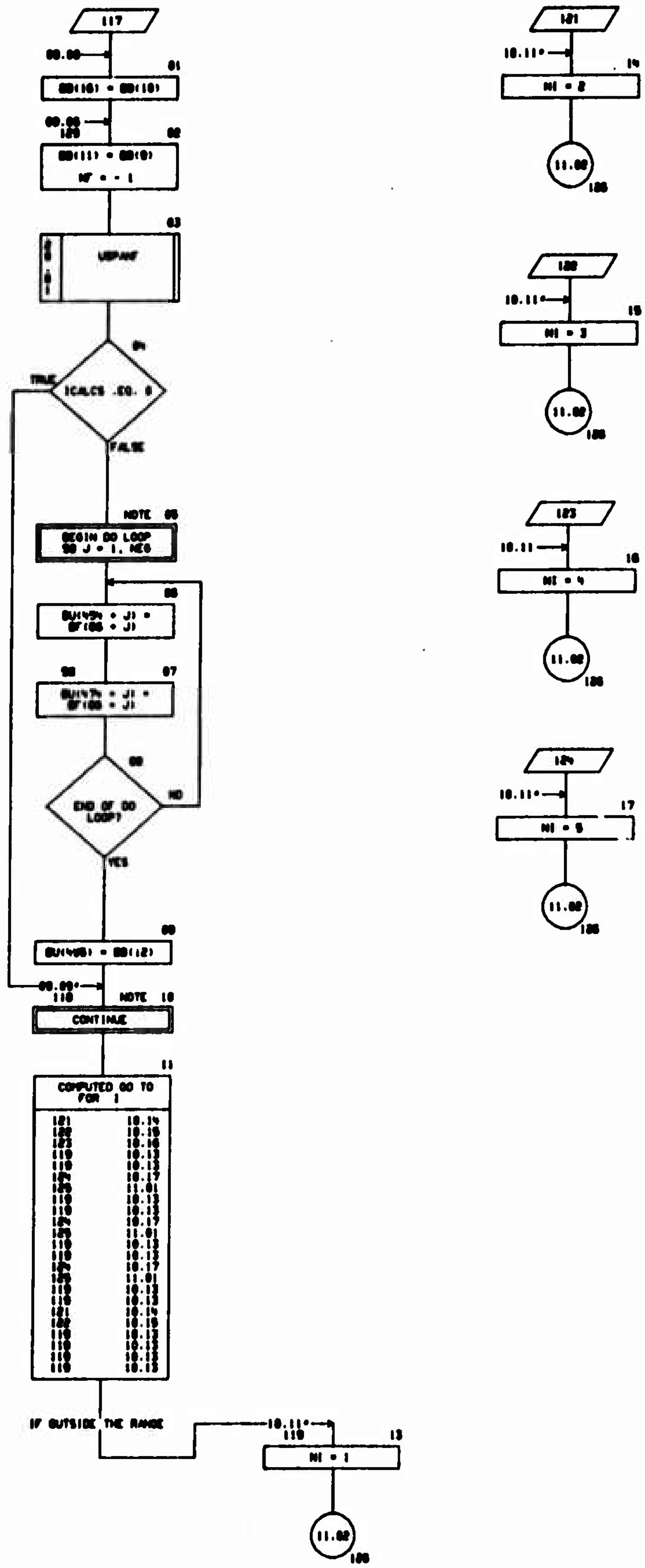


CHART TITLE - PROCEDURES

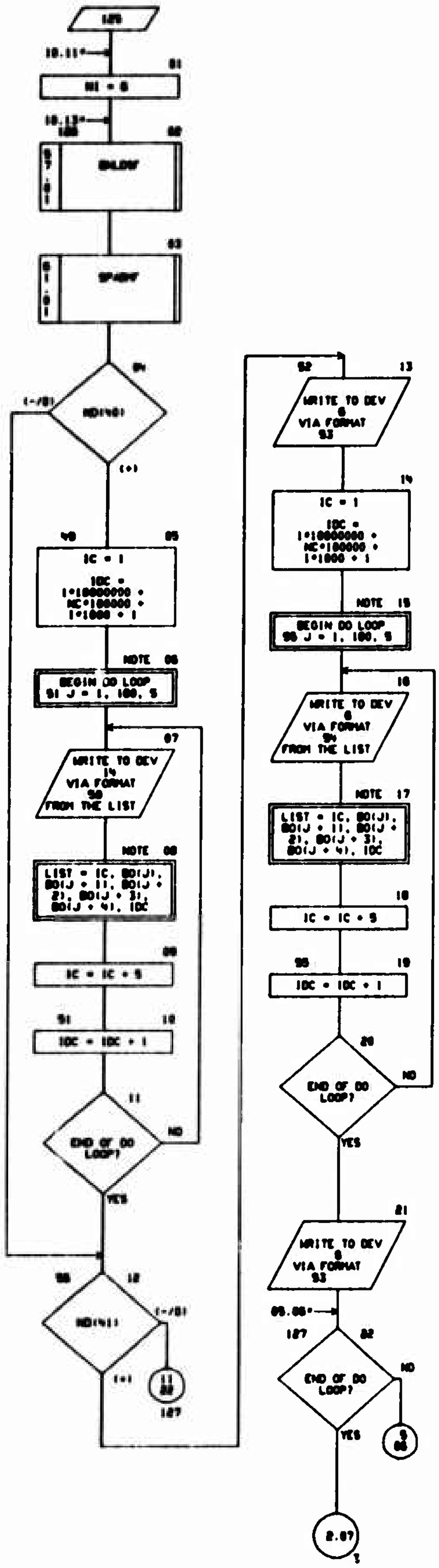


CHART TITLE - NON-PROCEDURAL STATEMENTS

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      COMMON TCOM(4400)
      DIMENSION ND(200),BD(240),BC(195),BB(20),BT(20),U(1053),BF(145),BP
     (73),BF(200),BU(300)
      EQUIVALENCE (ND(1),TCOM(4201)),(BD(1),TCOM(3963)),(BC(1),TCOM(2750
     )),(BB(1),TCOM(2953)),(BF(1),TCOM(4001)),(BT(1),TCOM(1001)),(BB(1)),
     TCOM(1951)),(BF(1),TCOM(1000)),(BP(1),TCOM(1195)),(I,ND(101)),(J,ND
     (102)),(IC,ND(103)),(IBC,ND(104)),(IR,ND(107)),(NI,ND(105)),(N7,ND
     (106)),(BU(1),TCOM(3153)),(ICALCS,ND(105)),(NCS,ND(42)),(NC,ND(100
     ))
4     FORMAT(3I12)
50    FORMAT(I12,1PE12.5,I0)
53    FORMAT(1H1)
54    FORMAT(1H 5X I12,3X1PE15.5,3X I0)
```

CHART TITLE - SUBROUTINE RERDAT

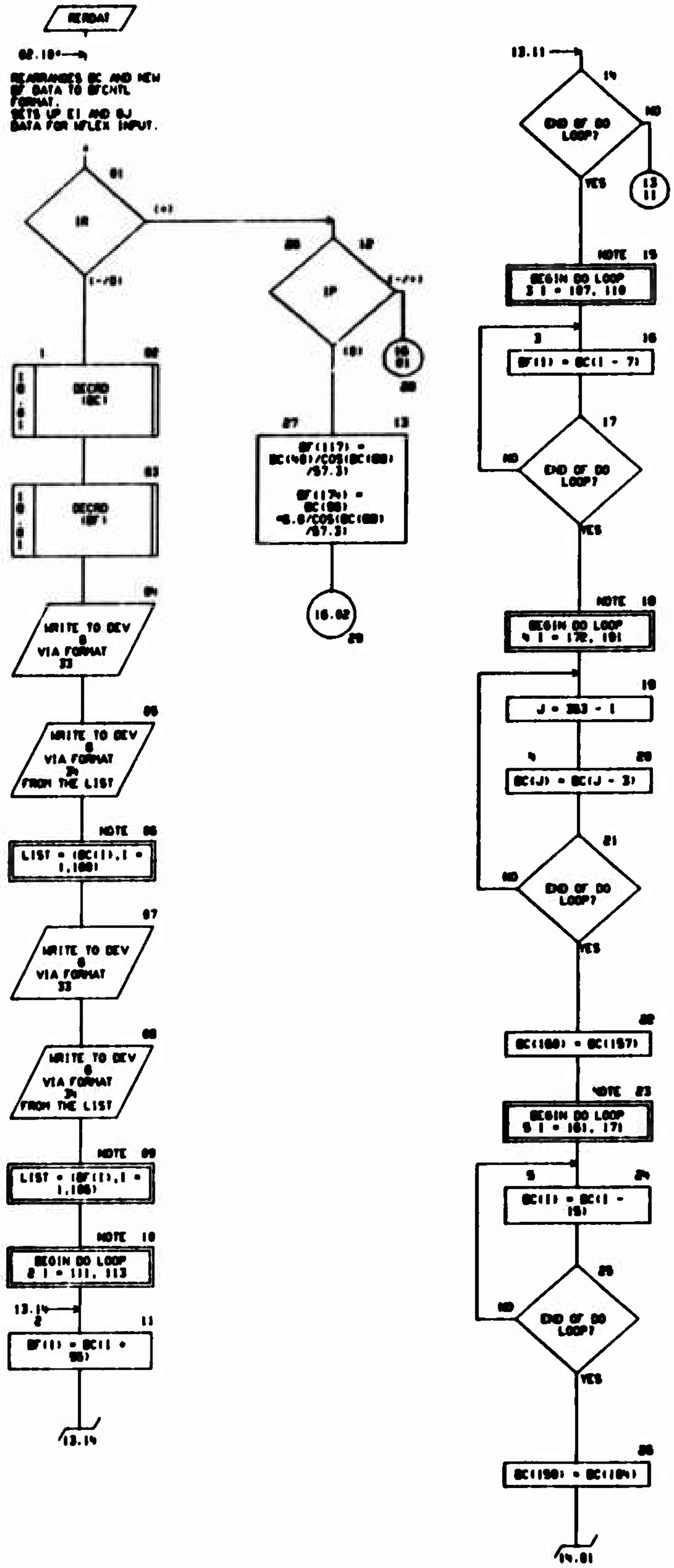


CHART TITLE - SUBROUTINE

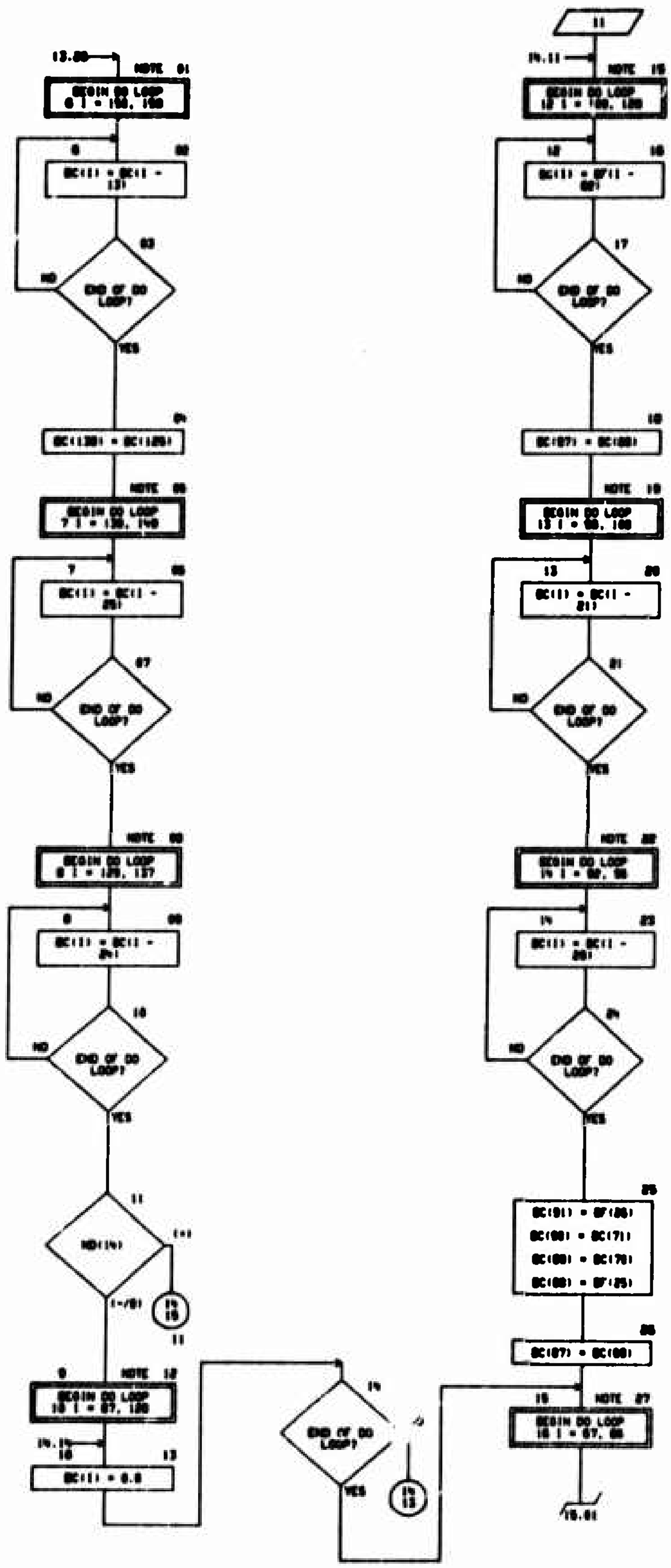
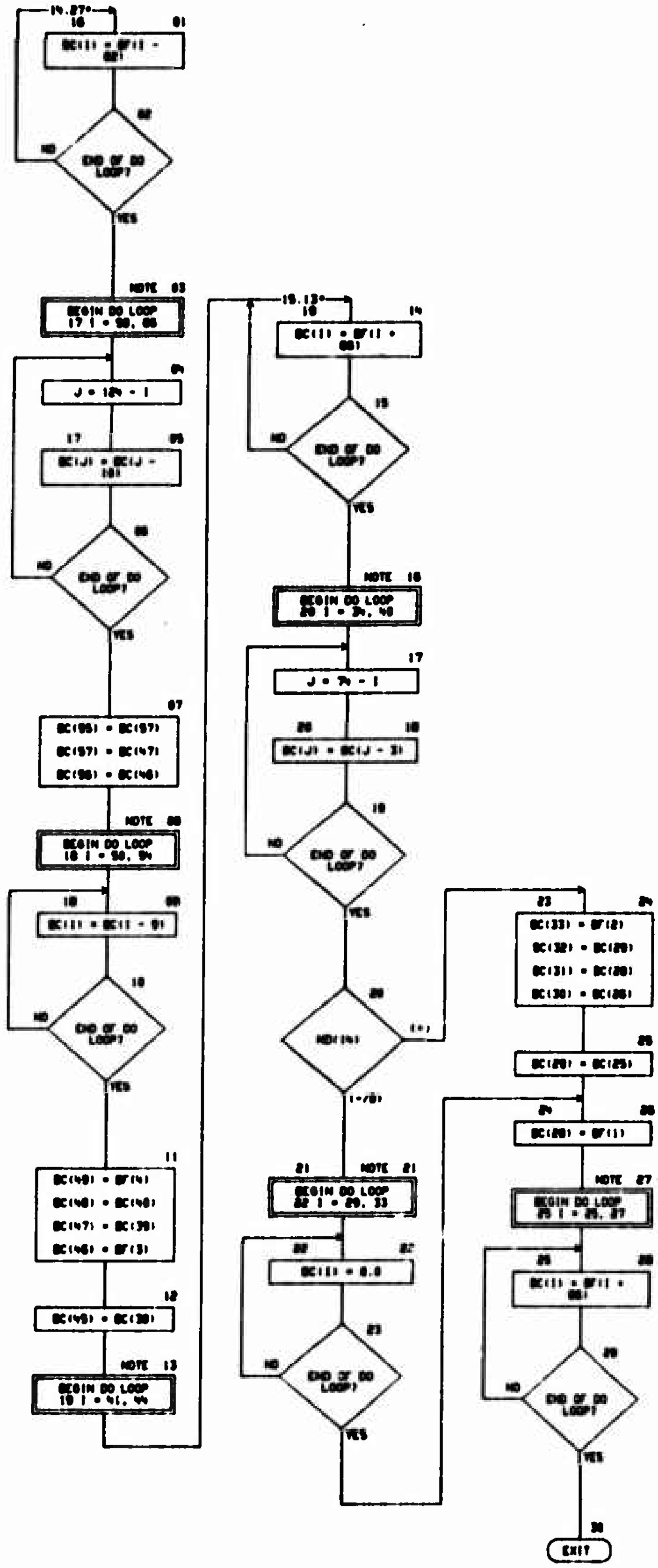


CHART TITLE - SUBROUTINE RERBAT



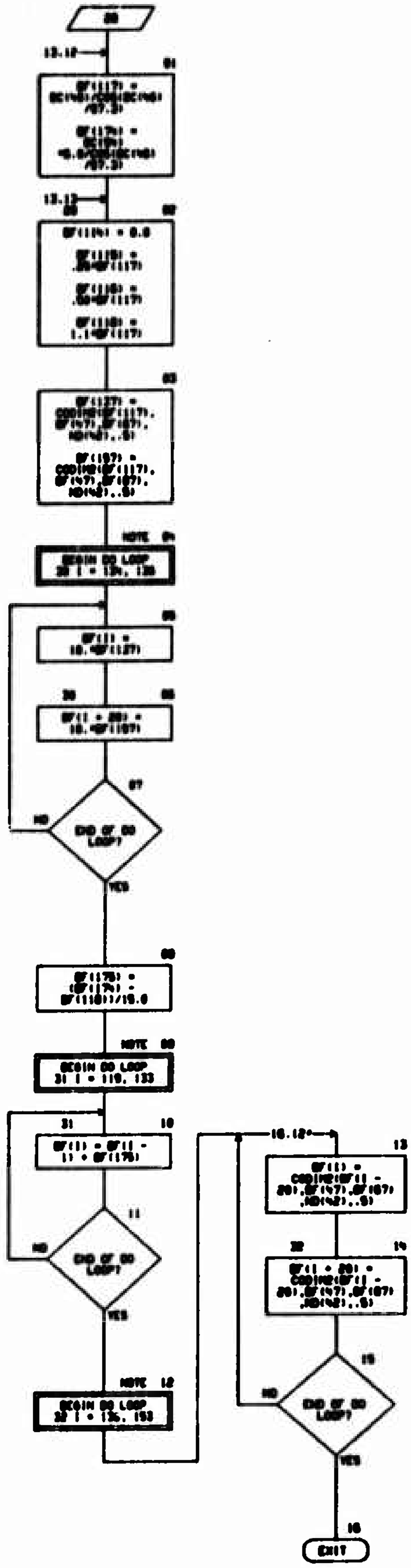


CHART TITLE - NON-PROCEDURAL STATEMENTS

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          COMMON TCOM(4400)
          DIMENSION BC(195),BF(200),ND(200)
          EQUIVALENCE (BC(1),TCOM(2750)),(BF(1),TCOM(4001)),(ND(1),TCOM(420
         )),(I,ND(132)),(J,ND(133)),(IR,ND(187)),(IP,ND(137))
 33       FORMAT(1H1)
 34       FORMAT(1H 5X1P5E15.5)
```

CHART TITLE - SUBROUTINE DECRD(V)

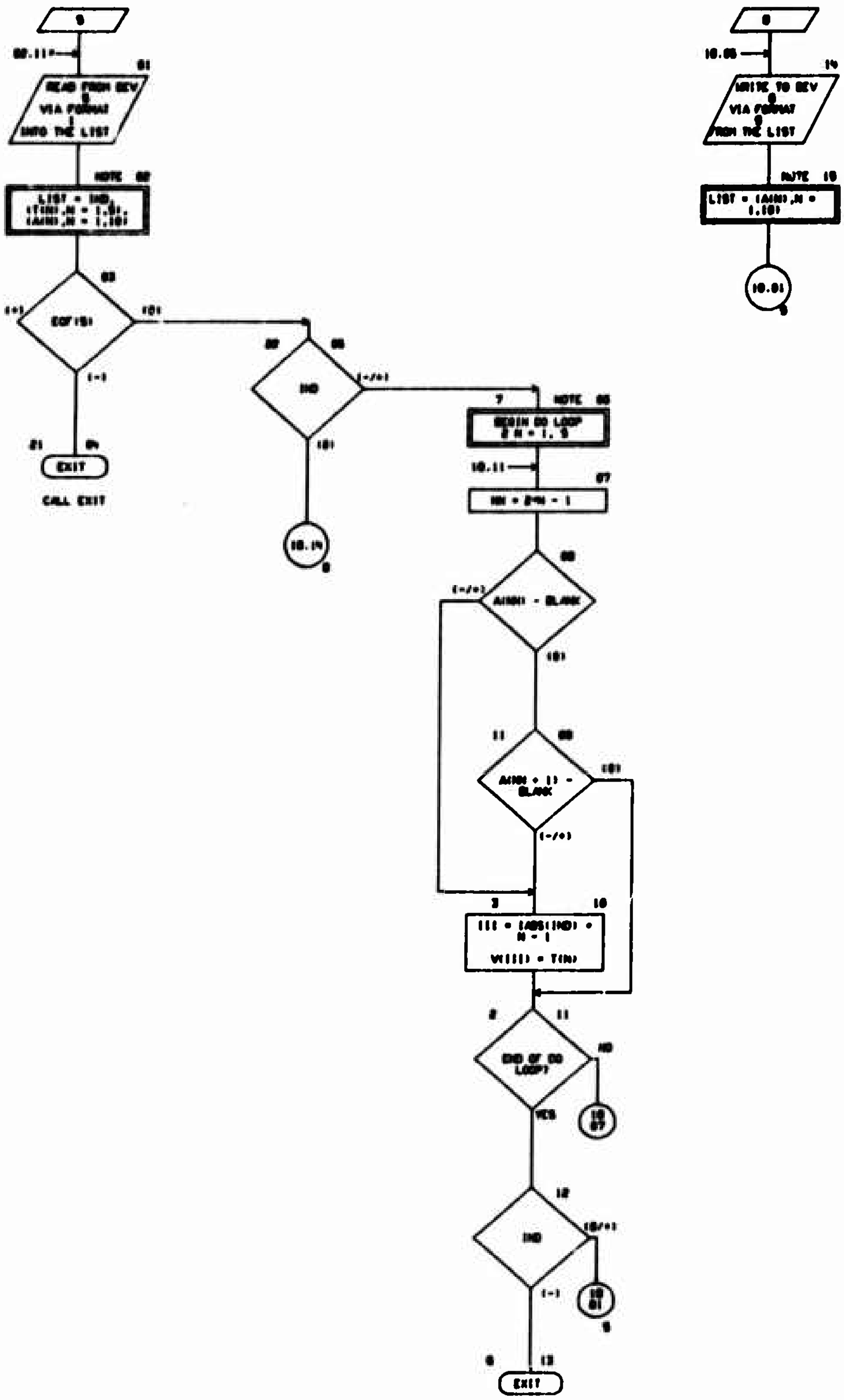


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
          DIMENSION V(1),T(5),A(18)
          DATA BLANK/6H      /
    1     FORMAT(T1,I12,T13,5F12.0,T13,18A8)
    9     FORMAT(/17H NO DECK LOCATION,5X,18A8/)
```

CHART TITLE - SUBROUTINE USPANT

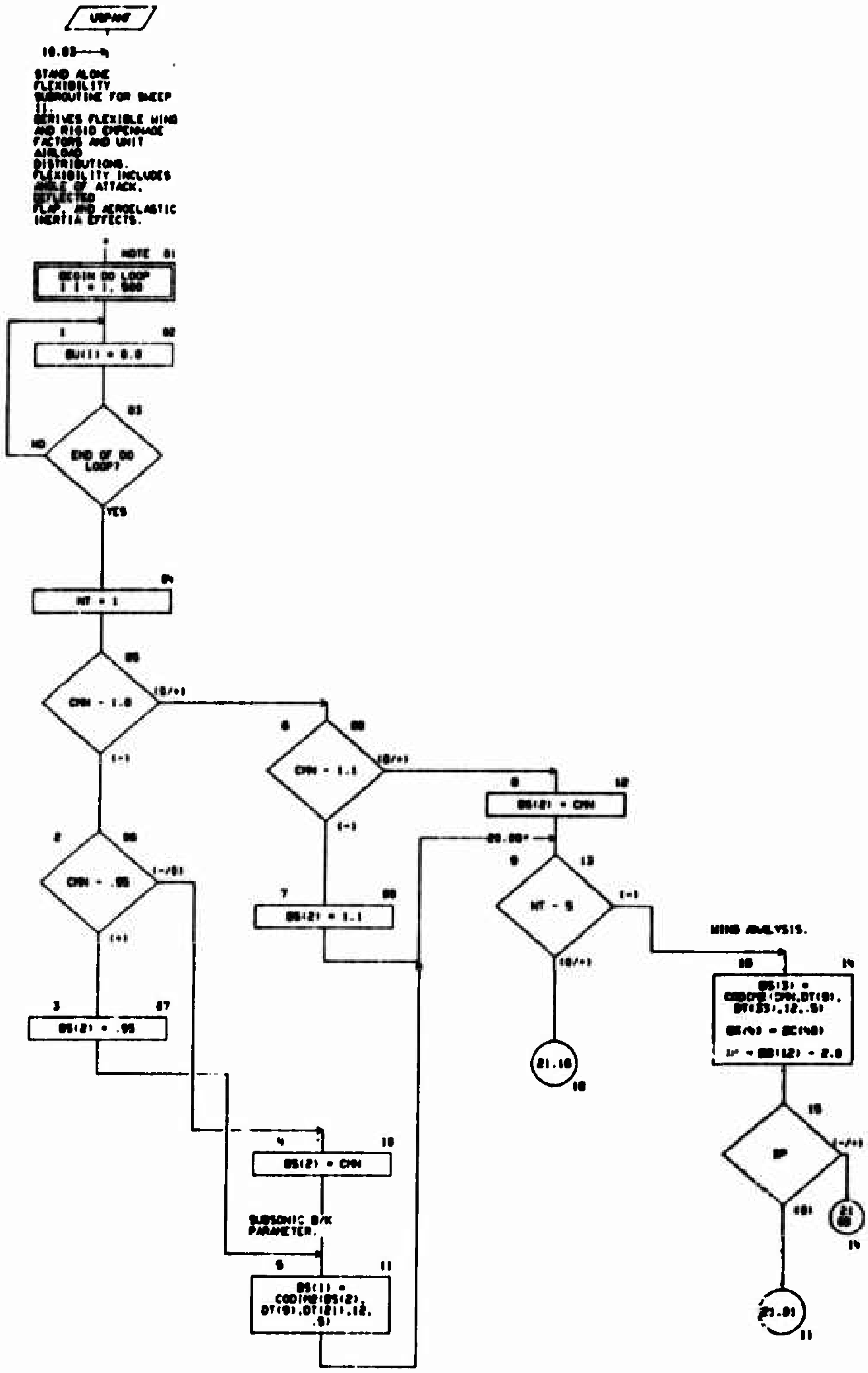
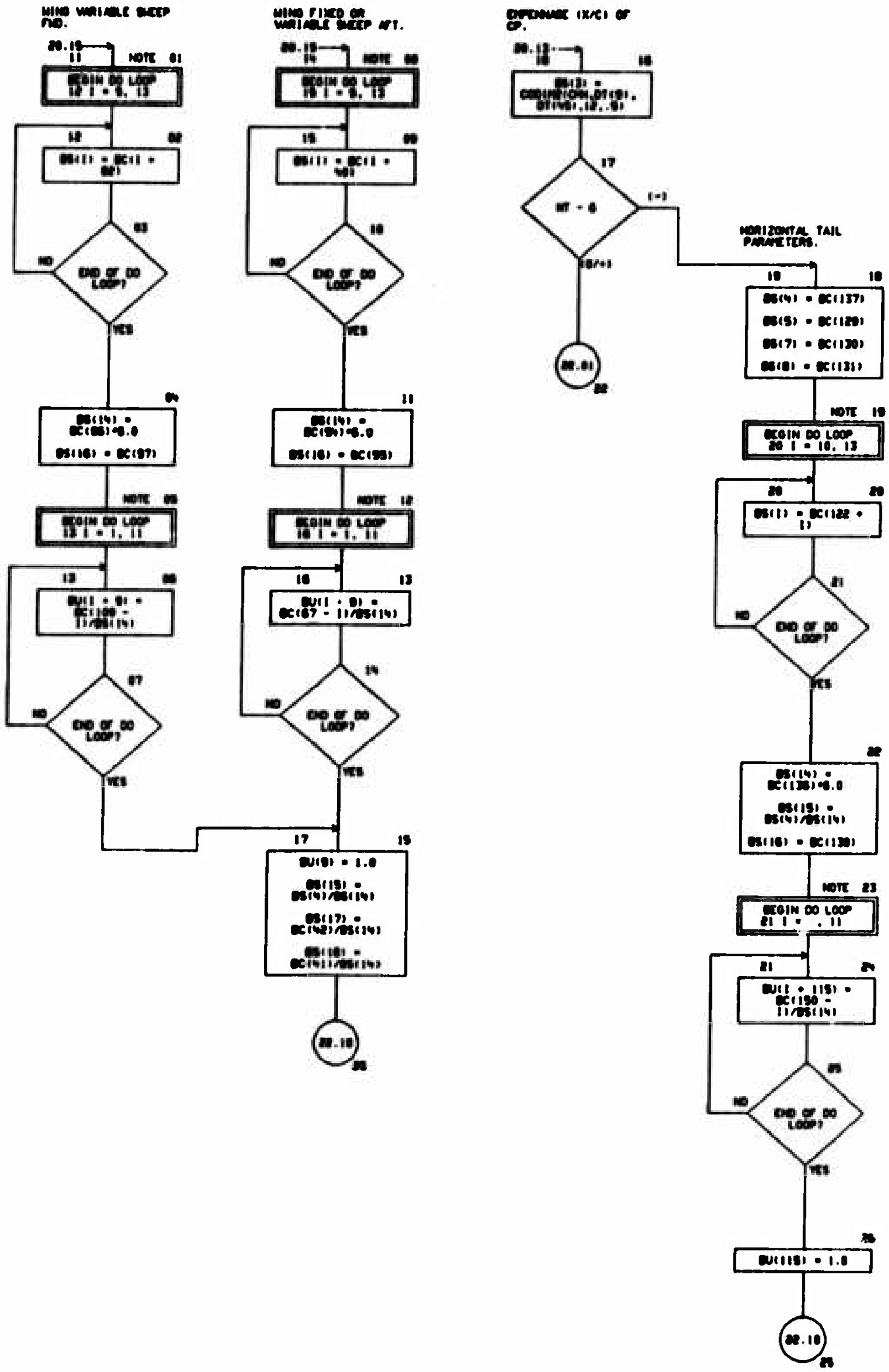


CHART TITLE - SUBROUTINE USPAF



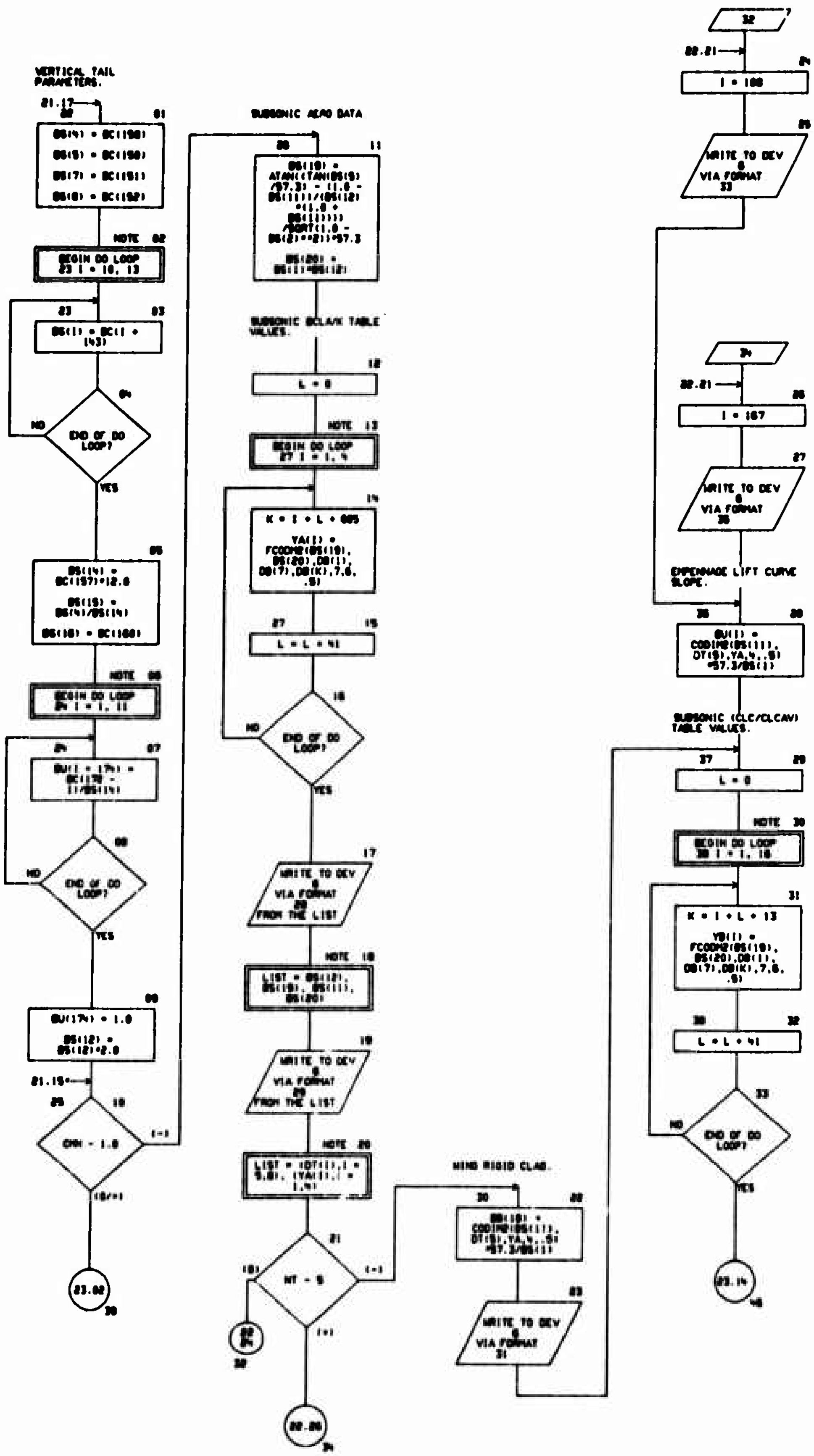


CHART TITLE - SUBROUTINE USPAN

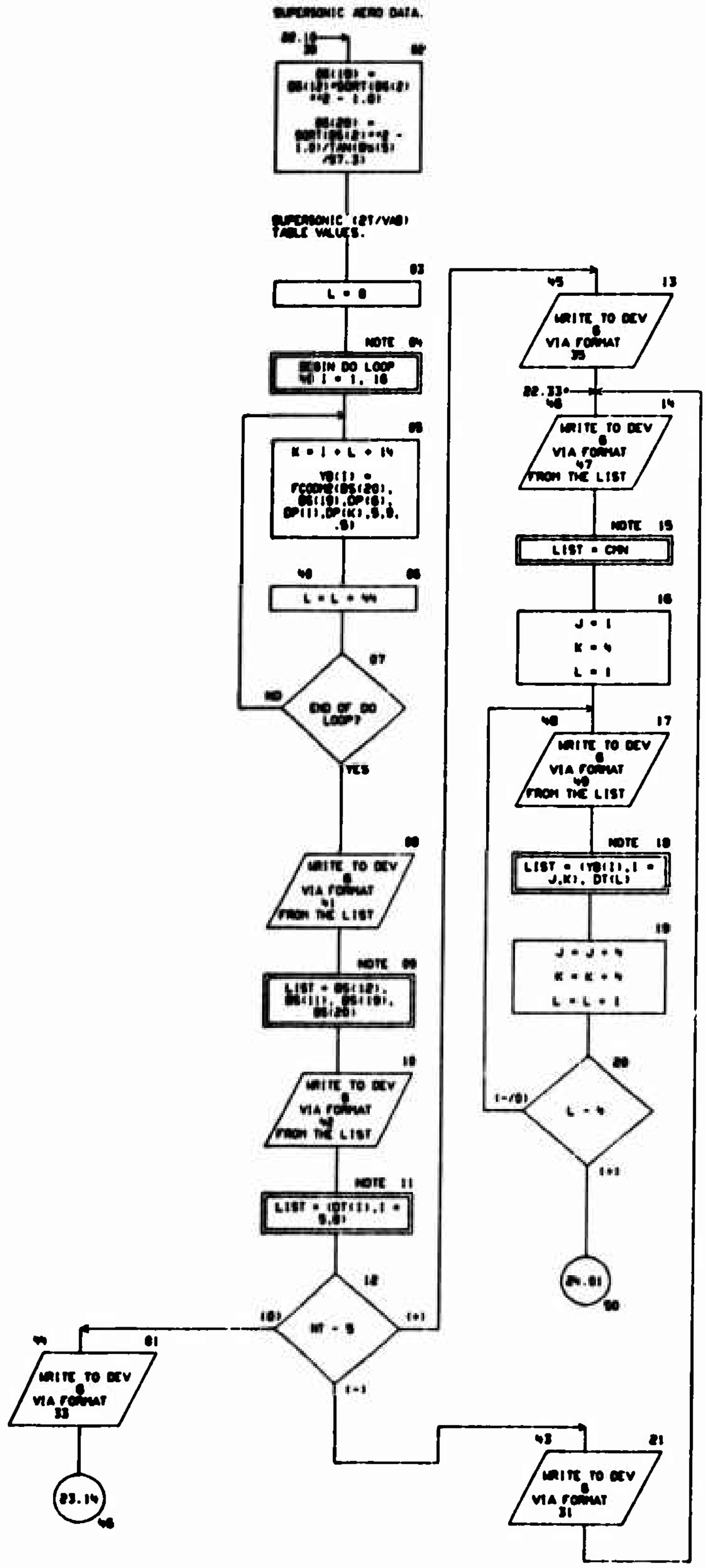


CHART TITLE - SUBROUTINE

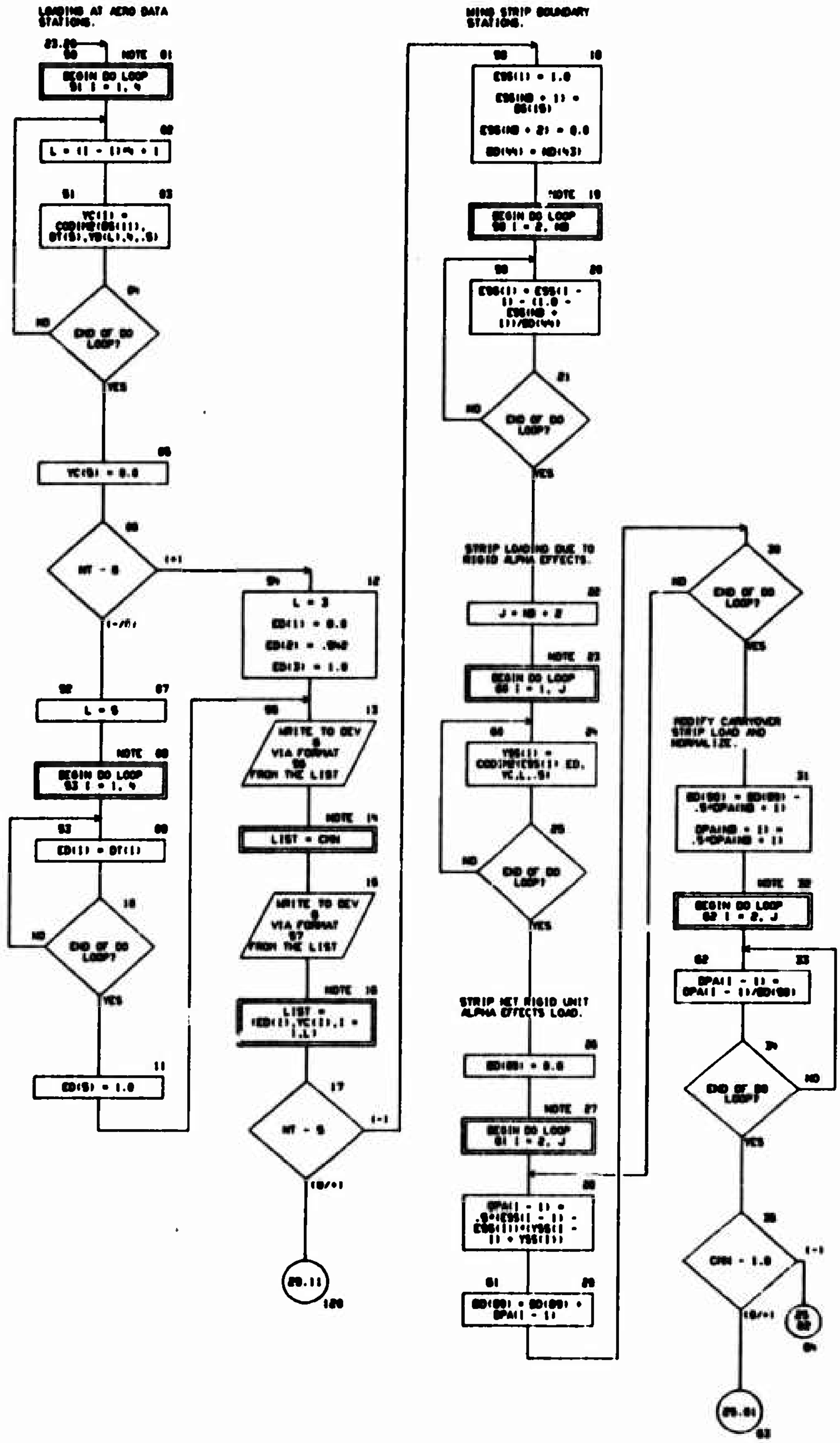


CHART TITLE - SUBROUTINE USPAN

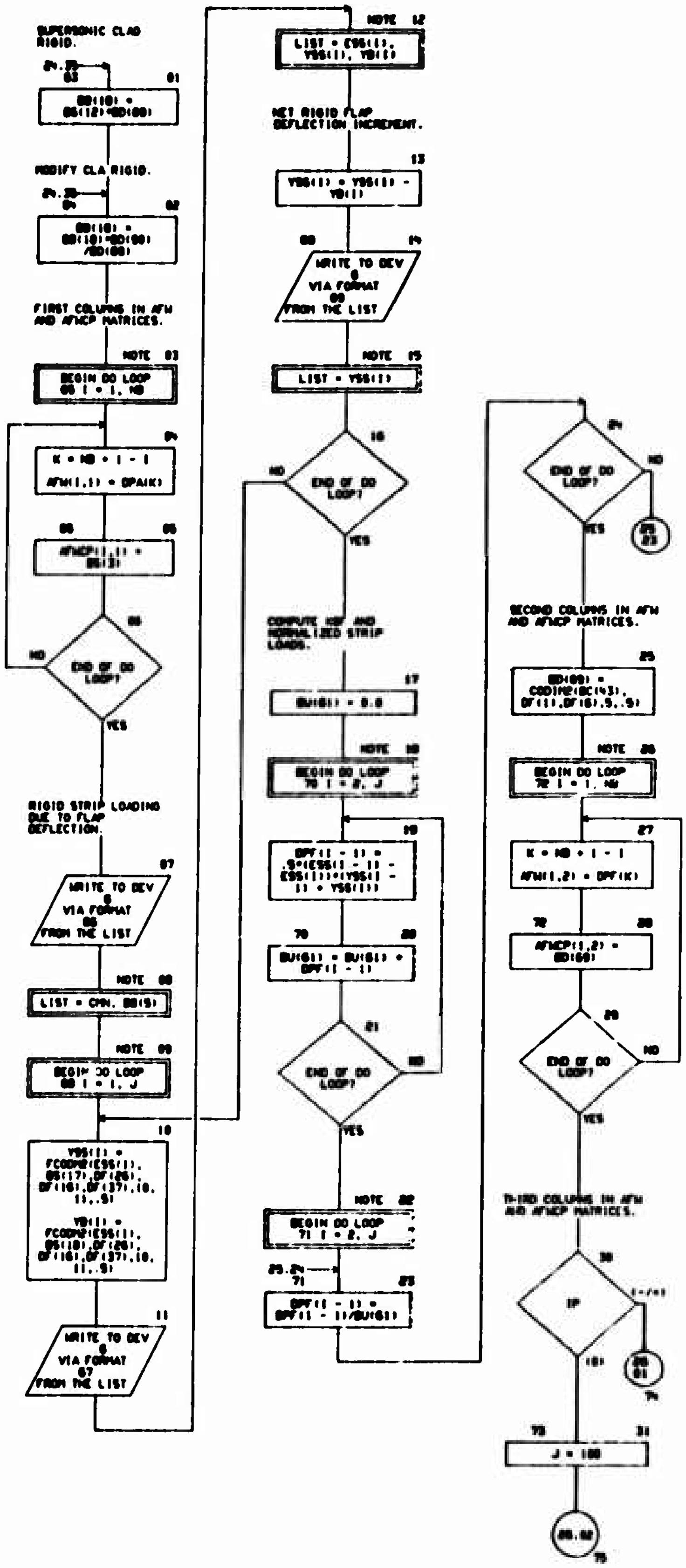


CHART TITLE - SUBROUTINE USPANF

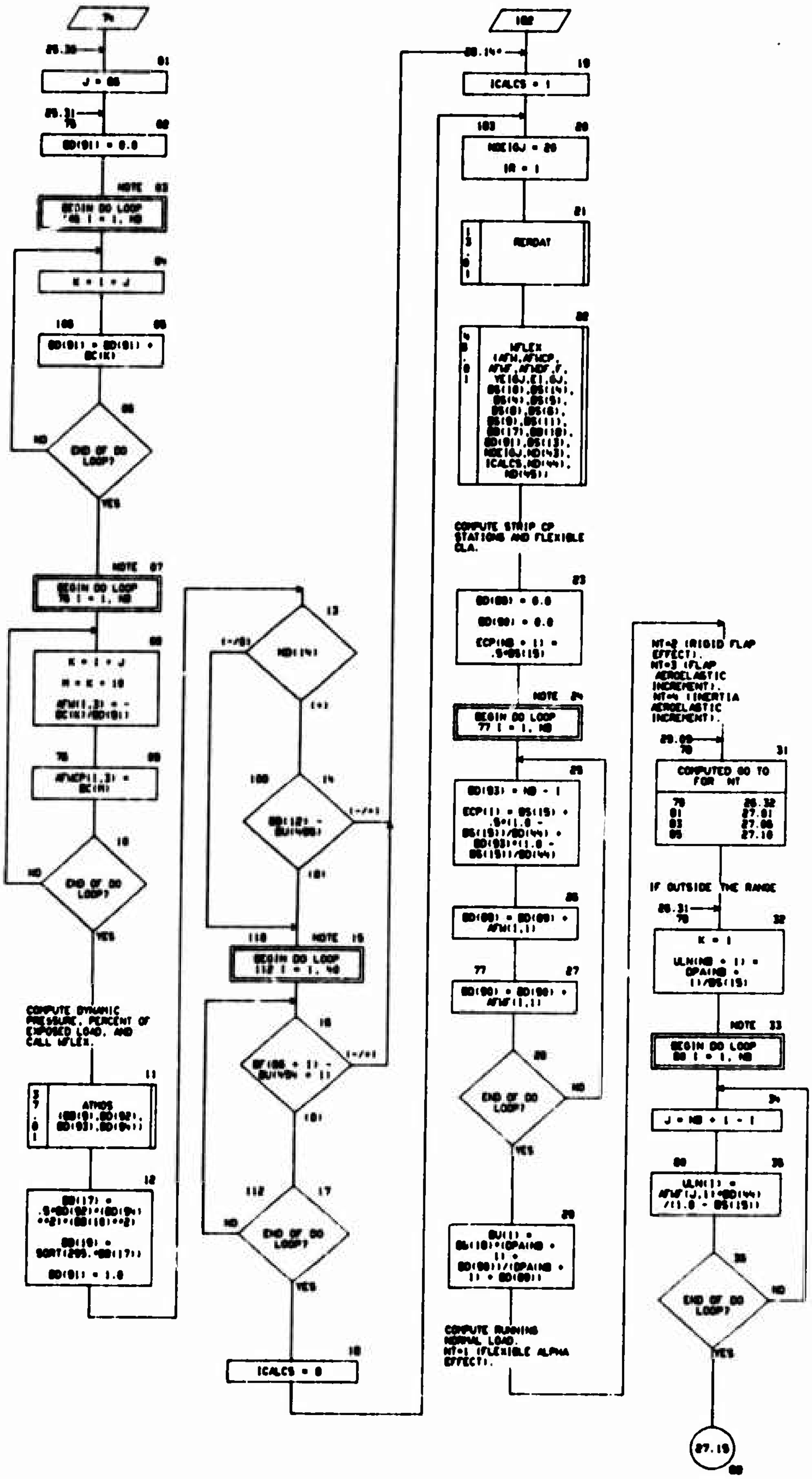


CHART TITLE - SUBROUTINE USPAN

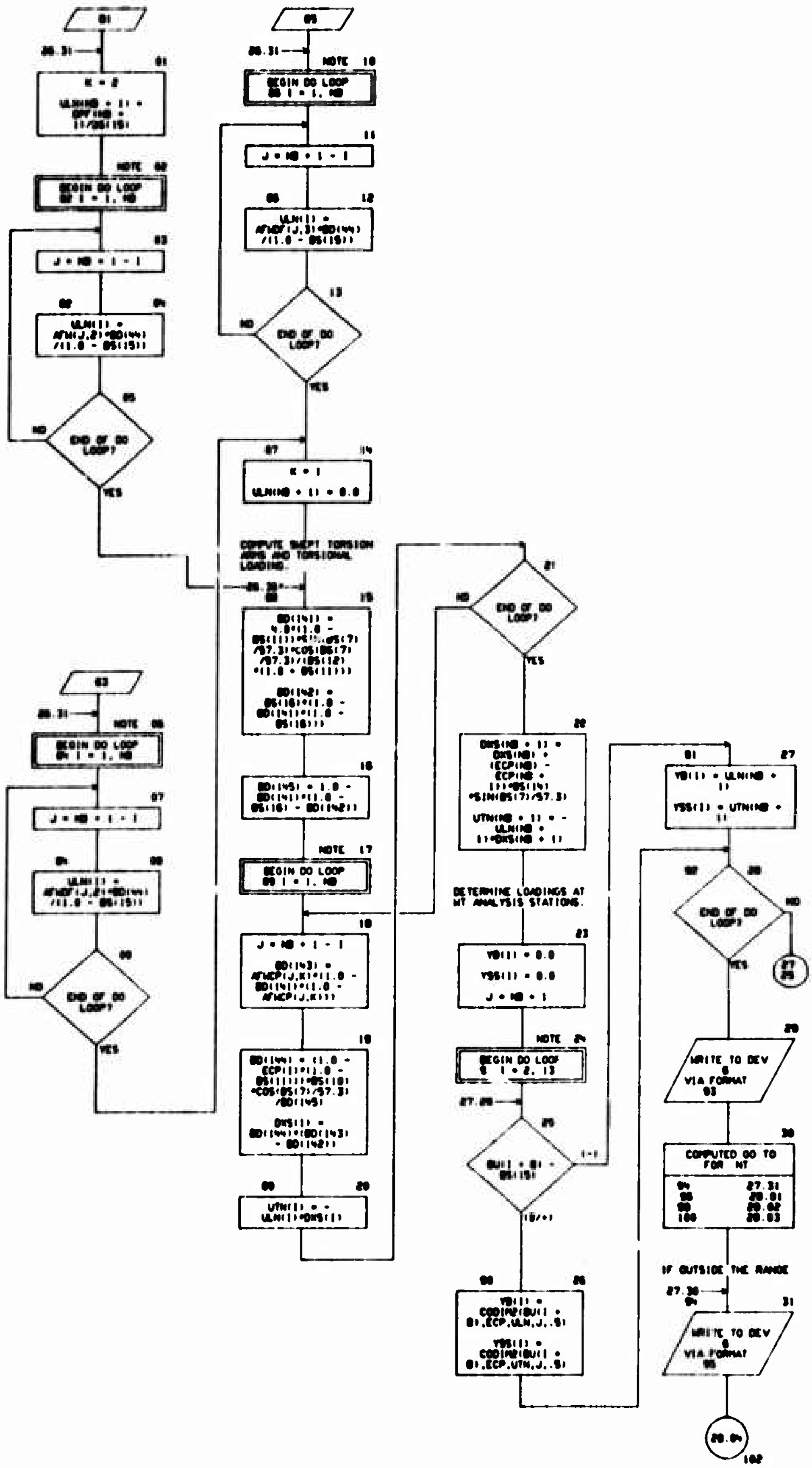


CHART TITLE - SUBROUTINE USPAN

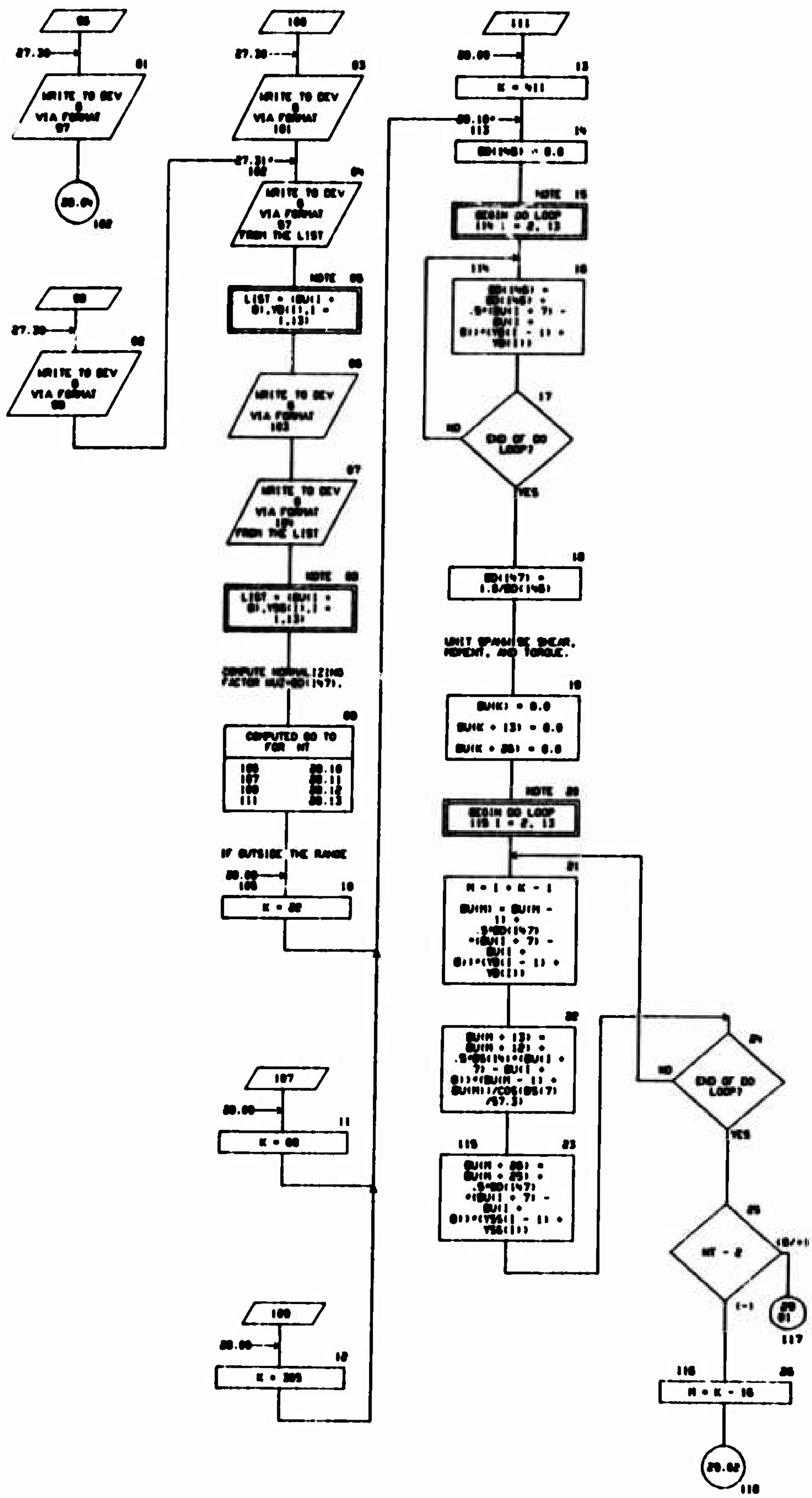
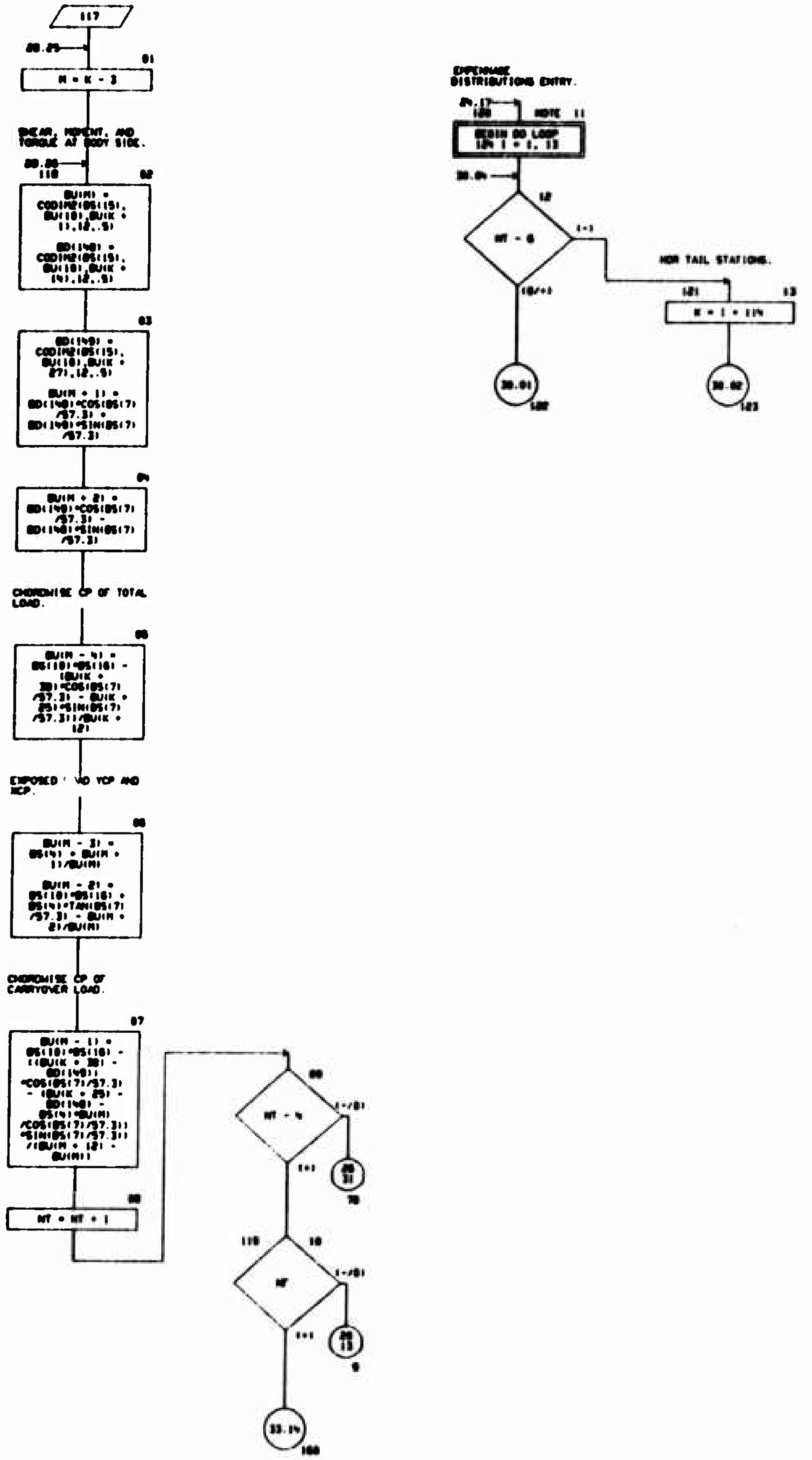


CHART TITLE - SUBROUTINE USPANF



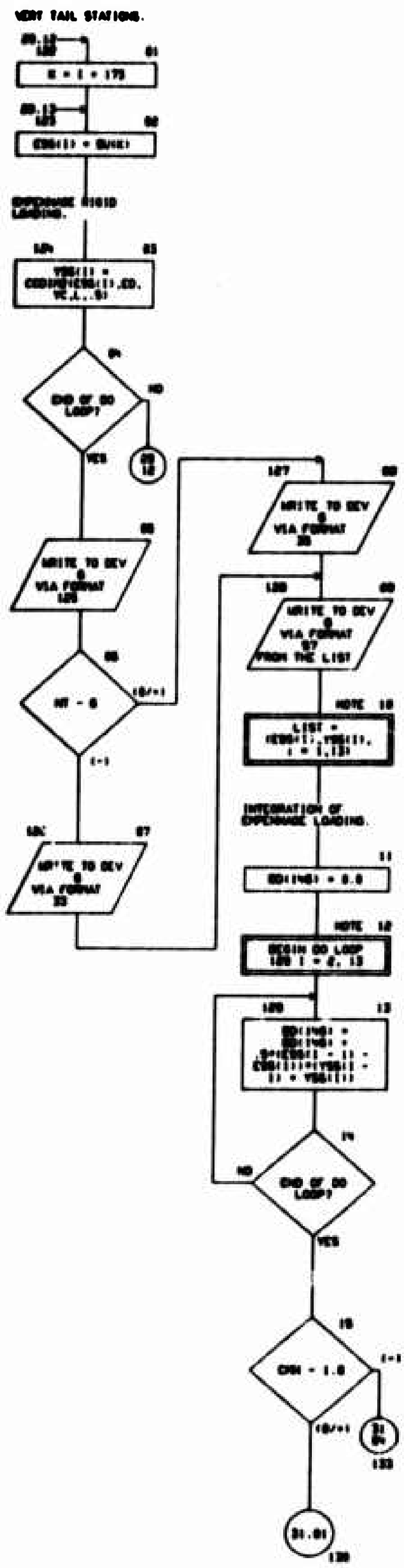

VERT TAIL STATIONS.
END OF DO LOOP?
NO
YES
WRITE TO DEV
VIA FORMAT
FROM THE LIST
NOTE
INTEGRATION OF EMPENNAGE LOADING.
BEGIN DO LOOP
END OF DO LOOP?
NO
YES

CHART TITLE - SUBROUTINE USPAN

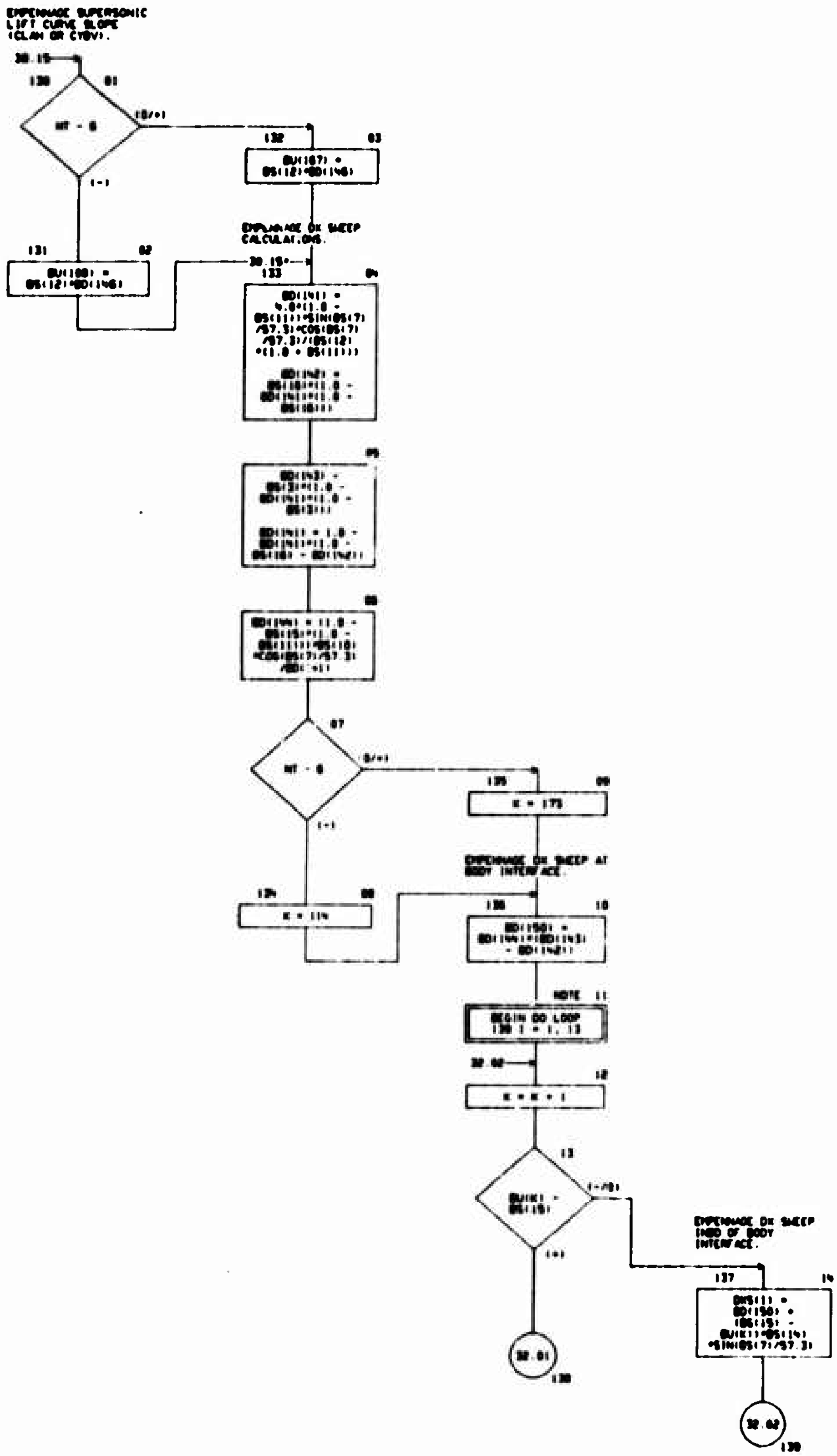


CHART TITLE - SUBROUTINE UGPANF

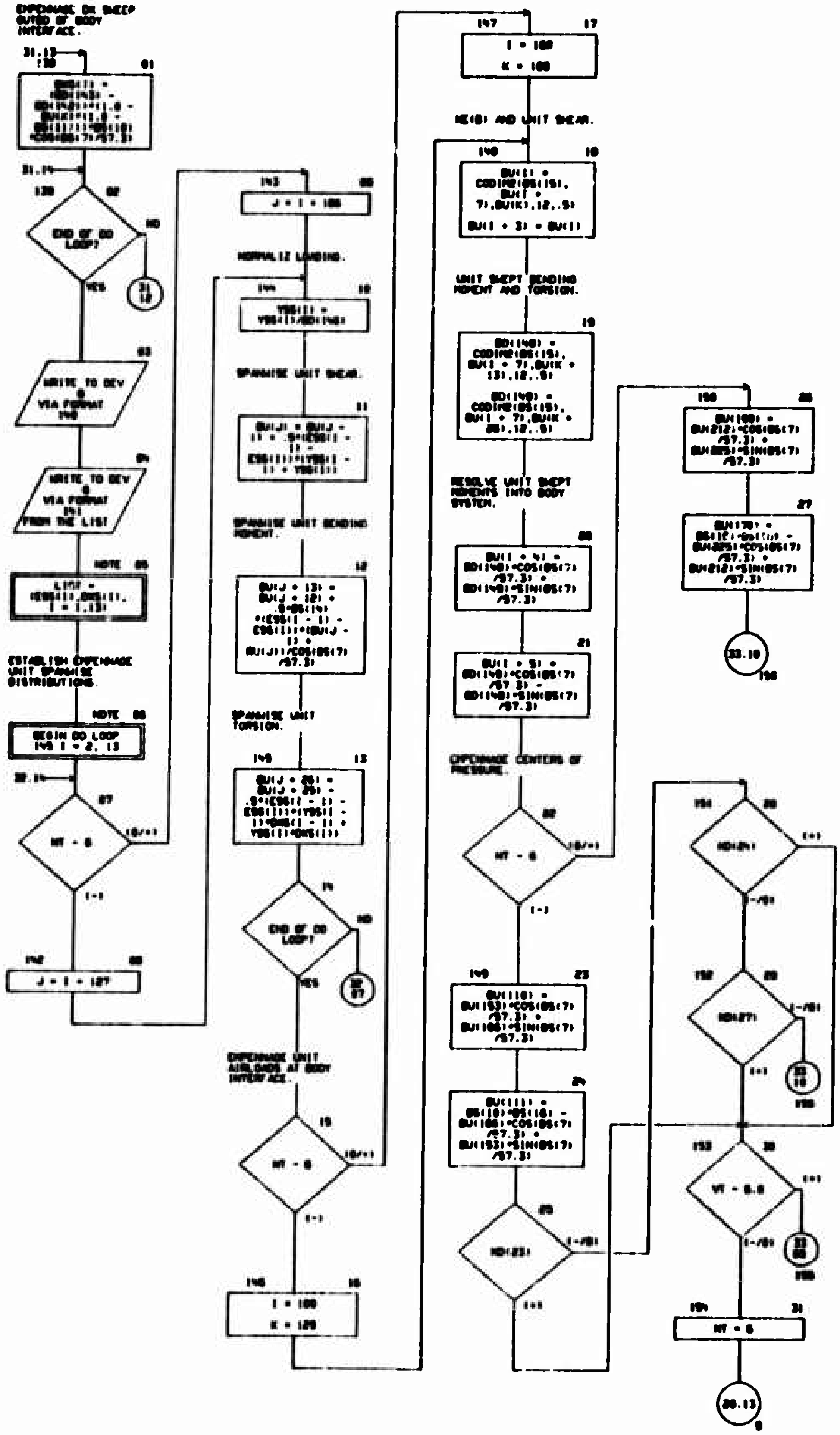


CHART TITLE - SUBROUTINE USPANF

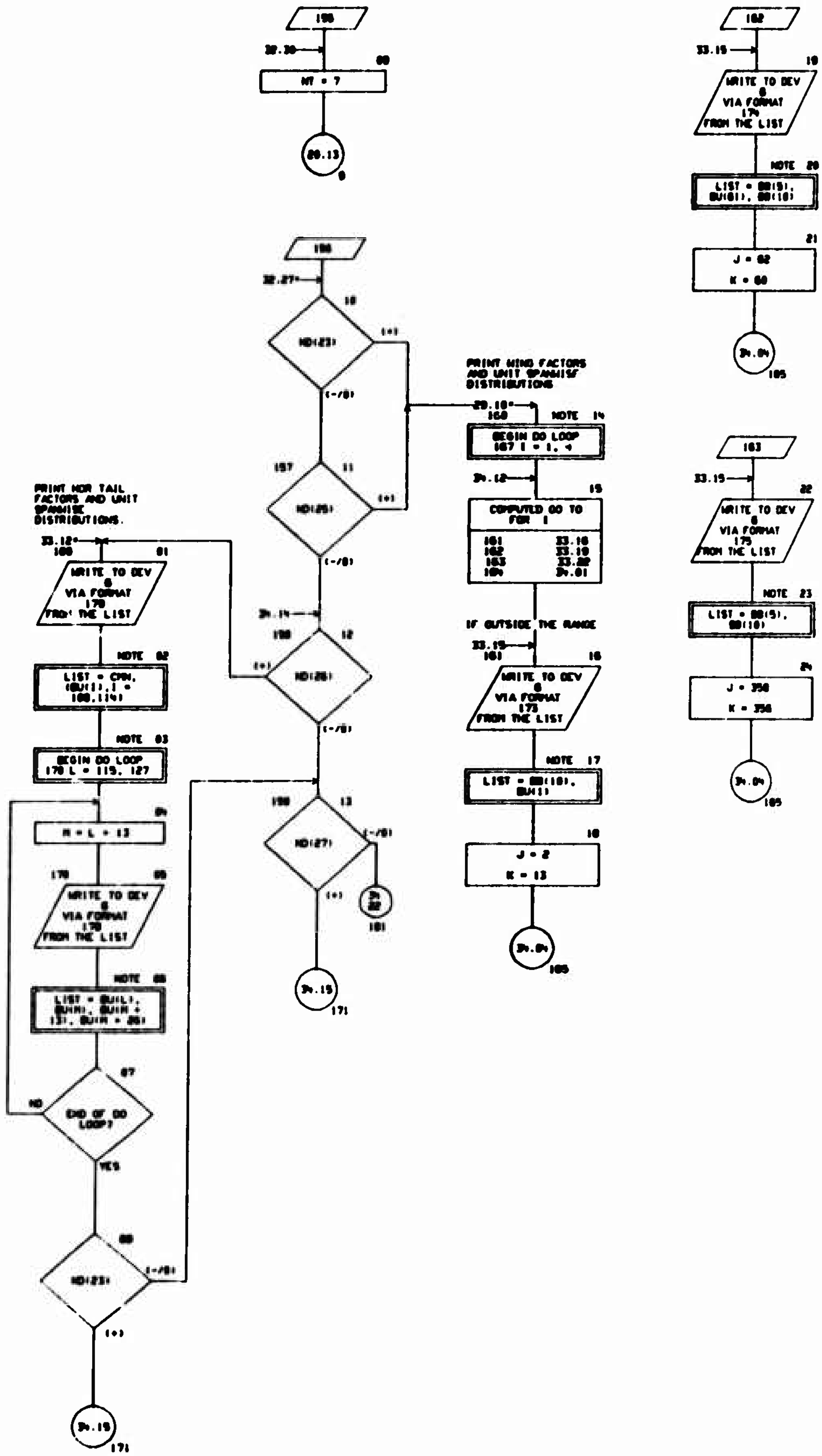


CHART TITLE - SUBROUTINE USPANF

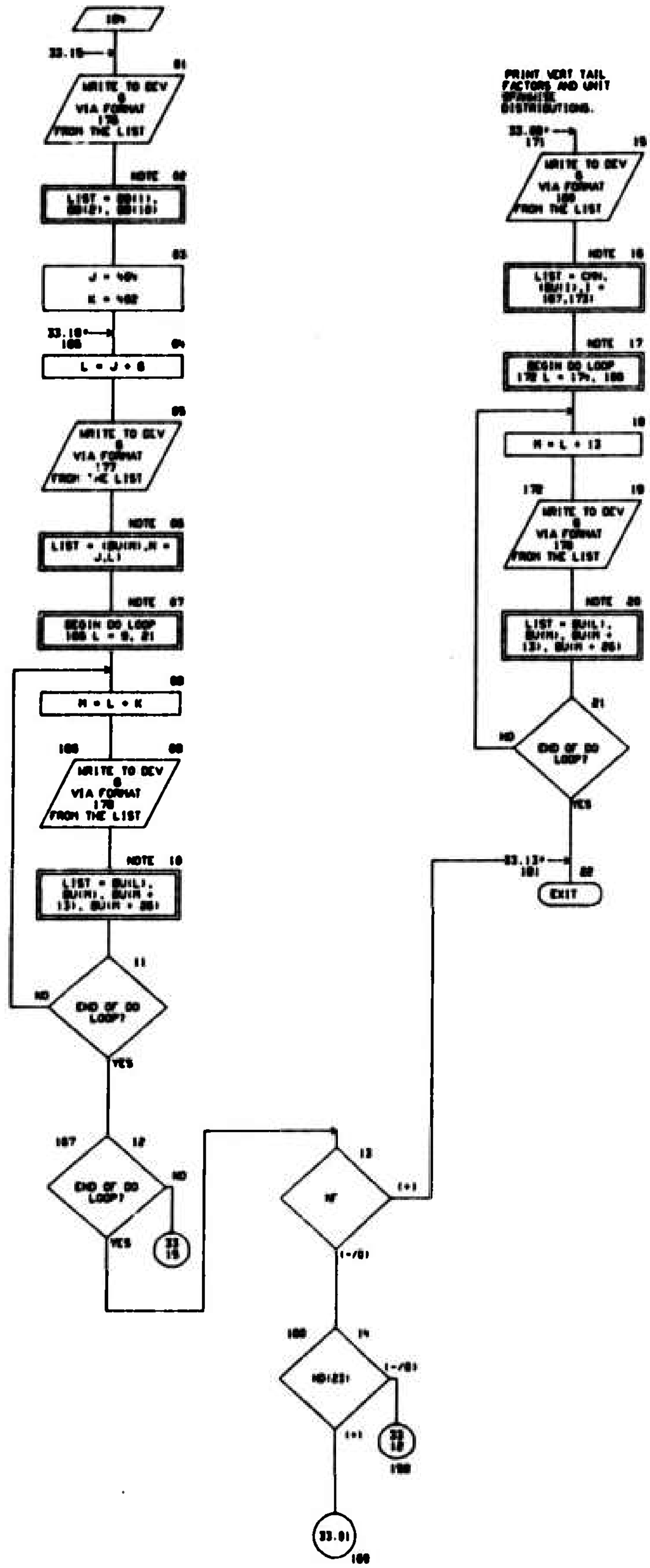


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
      COMMON TCOM(4400)
      DIMENSION ND(200),DT(96),DB(853),DF(146),DP(734),BC(195),BB(20),BS
     (20),BD(160),BU(500),BO(348),YA(4),YB(18),YC(5),ED(5),ESS(13),YSS(
     13),DPA(11),DPF(11),AFW(10,3),AFWCP(10,3),AFWF(10,3),AFWDF(10,3),F
     (3,4),YEIGJ(20),EI(20),GJ(20),ECP(11),ULN(11),DXS(13),UTN(11),BF(2
     00)
      EQUIVALENCE (DT(1),TCOM(100)),(DB(1),TCOM(196)),(DF(1),TCOM(1009))
     ,(DP(1),TCOM(1195)),(ND(1),TCOM(4201)),(BC(1),TCOM(2758)),(BB(1),T
     COM(2953)),(BS(1),TCOM(2973)),(BD(1),TCOM(2993)),(BU(1),TCOM(3153)
     ),(BO(1),TCOM(3853)),(BF(1),TCOM(4001)),(AFW(1,1),BU(226)),(AFWCP(
     1,1),BU(256)),(AFWF(1,1),BU(286)),(AFWDF(1,1),BU(316)),(F(1,1),BU(
     346)),(YEIGJ(1),BF(114)),(EI(1),BF(134)),(GJ(1),BF(154)),(CMN,BO(1
     0)),(VT,BB(14)),(YA(1),BO(1)),(YB(1),BO(5)),(YC(1),BO(21)),(ED(1),
     BO(26)),(ESS(1),BO(31)),(YSS(1),BO(45)),(DPA(1),BO(58)),(DPF(1),BO
     (70)),(ECP(1),BO(95)),(ULN(1),BO(106)),(DXS(1),BO(117)),(UTN(1),BO
     (130)),(NB,ND(43)),(ICALCS,ND(105)),(NOEIGJ,ND(103)),(IR,ND(107))
      EQUIVALENCE (NF,ND(108)),(I,ND(132)),(J,ND(133)),(K,ND(134)),(L,ND
     (135)),(M,ND(136)),(IP,ND(137)),(NT,ND(149))
28    FORMAT(1H110X33HVALUES FROM BCLA/K TABLES FOR AR=F8.4,3X4HSWB=F6.2
     ,3X3HTR=F7.4,3X5HBA/K=F8.4)
29    FORMAT(1H07X3HTR=4F10.2//11X4F10.5)
31    FORMAT(1H+53X6H(WING))
33    FORMAT(1H+53X10H(HOR TAIL))
35    FORMAT(1H+53X11H(VERT TAIL))
41    FORMAT(1H17X3HAR=F8.4,3X3HTR=F7.4,3X3HBA=F8.4,3X3HBM=F8.4)
42    FORMAT(1H07X3HTR=4F10.2)
47    FORMAT(1H010X34HVALUES FROM LOADING TABLES FOR MN=F6.3)
49    FORMAT(1H010X4F10.5,3X4HSTA=F6.3)
56    FORMAT(1H110X7HSTATION10X24HLOADING AT DATA STATIONS5X3HMN=F6.3)
57    FORMAT(1H 2F17.5)
66    FORMAT(1H110X7HSTATION10X9HOUTB LONG10X8HINBD LONG10X9HFLAP INCR5X
     3HMN=F6.3,5X3HDF=F6.2)
67    FORMAT(1H F17.5,F18.5,F19.5)
68    FORMAT(1H+54XF19.5)
93    FORMAT(1H19X8HANALYSIS/10X8HSTATIONS10X8HLOADING-)
95    FORMAT(1H+35X21HFLEXIBLE ALPHA EFFECT)
97    FORMAT(1H+35X17HRIGID FLAP EFFECT)
99    FORMAT(1H+35X26HFLAP AEROELASTIC INCREMENT)
101   FORMAT(1H+35X29HINERTIA AEROELASTIC INCREMENT)
103   FORMAT(1H09X8HANALYSIS/10X8HSTATIONS10X8HTOR LODG)
104   FORMAT(1H F17.5,F18.4)
125   FORMAT(1H010X7HSTATION10X25HLOADING-ANALYSIS STATIONS)
140   FORMAT(1H010X7HSTATION10X8HDX SWEEP)
141   FORMAT(1H F17.5,F17.3)
173   FORMAT(1H16X30HWING FLEXIBLE ALPHA PARAMETERS4X3HMN=F6.3,4X4HCLA=F
     8.5)
174   FORMAT(1H16X26HRIGID FLAP DOWN PARAMETERS4X3HDF=F6.2,4X4HKBF=F8.5,
     4X3HMN=F6.3)
175   FORMAT(1H16X27HAEROELASTIC FLAP PARAMETERS4X3HDF=F6.2,4X3HMN=F6.3)
176   FORMAT(1H16X30HAEROELASTIC INERTIA PARAMETERS4X7HWEIGHT=F8.0,4X5HF
     SCG=F8.2,4X3HMN=F6.3)
177   FORMAT(1H06X8HDXTOTAL=F8.2,4X6HYW(B)=F7.2,4X7HDXW(B)=F8.2,4X7HDXB(
     W)=F8.2//7X18HSIDE OF BODY UNITS//7X6HUSZWB=F8.5,4X6HUMXWB=F8.3,4X
     6HUMYWB=F8.3//7X27HSPANWISE UNIT DISTRIBUTIONS//9X3HSTA7X7HUSZW(B)
     4X7HUMXW(B)4X7HUMYW(B)/8X5HSWEPT18X5HSWEEP6X5HSWEEP/)
178   FORMAT(1H 6XF7.4,F12.5,2F11.3)
179   FORMAT(1H16X19HHOR TAIL PARAMETERS5X3HMN=F6.3//7X4HCLA=F8.5,4X6HKH
     (B)=F7.5,4X3HYH=F7.2,4X4HDXH=F8.2//7X18HSIDE OF BODY UNITS//7X6HUS
     ZHB=F8.5,4X6HUMXHB=F8.3,4X6HUMYHB=F8.3//7X27HSPANWISE UNIT DISTRIB
     UTIONS//9X3[illegible]STA7X7HUSZH(B)4X7HUMXH(B)4X7HUMYH(B)/8X5HSWEPT18X5HSWE
     EP6X5HSWEEP/)
180   FORMAT(1H16X20HVERT TAIL PARAMETERS5X3HMN=F6.3//7X4HCYB=F8.5,4X6HK
     V(B)=F7.5,4X4HDZV=F7.2,4X4HDXV=F8.2//7X17HTOP OF BODY UNITS//7X6HU
```

CHART TITLE - NON-PROCEDURAL STATEMENTS

```
SYVB=F8.5,4X6HUPXVB=F8.3,4X6HUPZVB=F8.3//7X27HSPANWISE UNIT DISTRI
BUTIONS//8X3HSTA7X7HUSYV(B)4X7HUPXV(B)4X7HUPZV(B)/8X5HSWEPT18X5HSW
EEP8X5HSWEEP/)
```

CHART TITLE - SUBROUTINE ATMOS(H,RHOH,PH,AH)

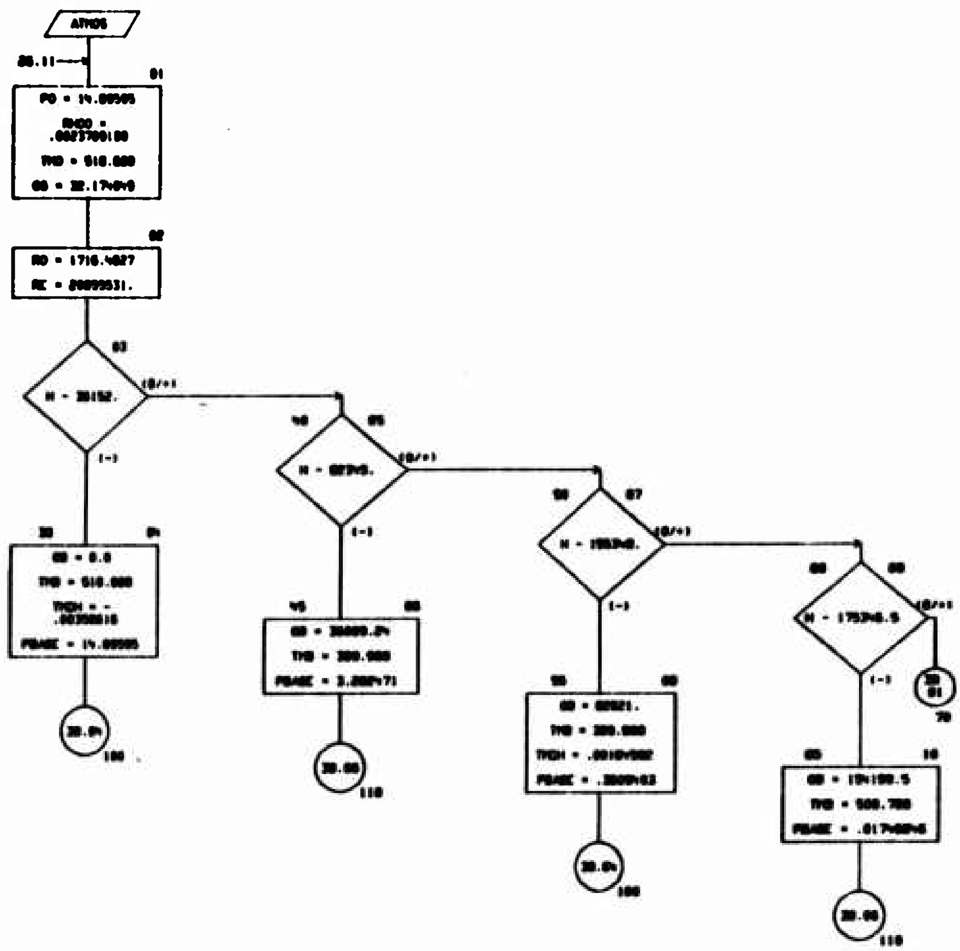


CHART TITLE - SUBROUTINE ATMOS(H,RHOH,PH,AH)

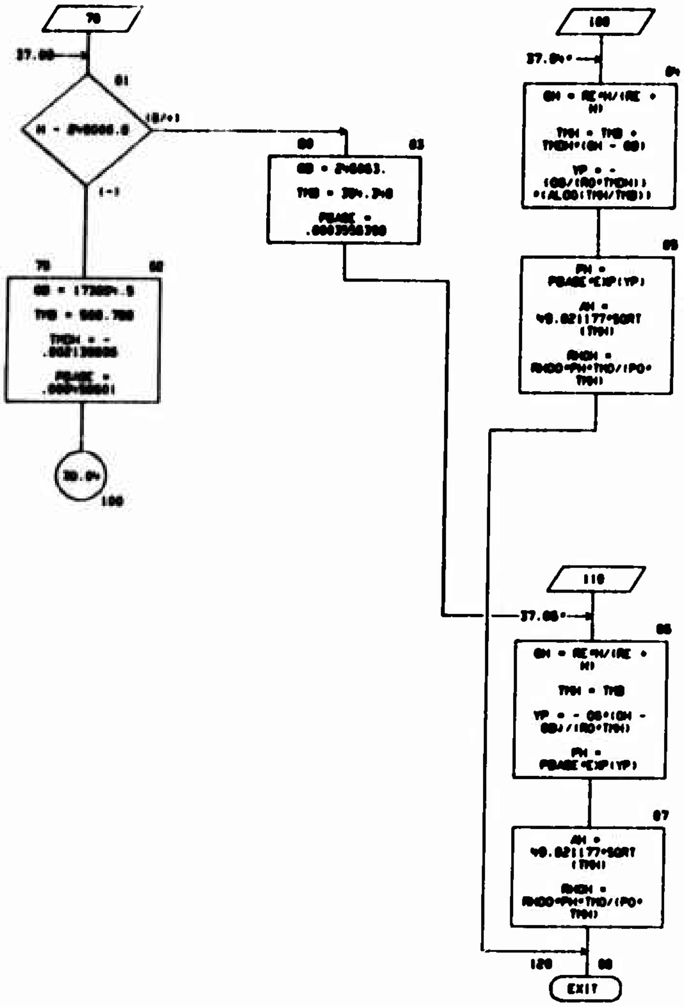


CHART TITLE - FUNCTION FCOOM2(X,Y,XI,YI,ZI,NI,N2,XK)

TWO DIMENSION CURVE FIT
SUBPROGRAM....FCOOM2
CALLING SEQUENCE
Z = FCOOM2(X,Y,XI,YI,ZI,NI,N2,XK)
X = ARGUMENT - 1ST VARIABLE
Y = ARGUMENT - 2ND VARIABLE
XI = ARRAY OF 1ST VARIABLE
YI = ARRAY OF 2ND VARIABLE
ZI = ARRAY OF THE DEPENDENT VARIABLE
NI = NO. OF POINTS - YI
N2 = NO. OF POINTS - XI
XK = END INTERVAL INTERPOLATION CONTROL CONSTANT

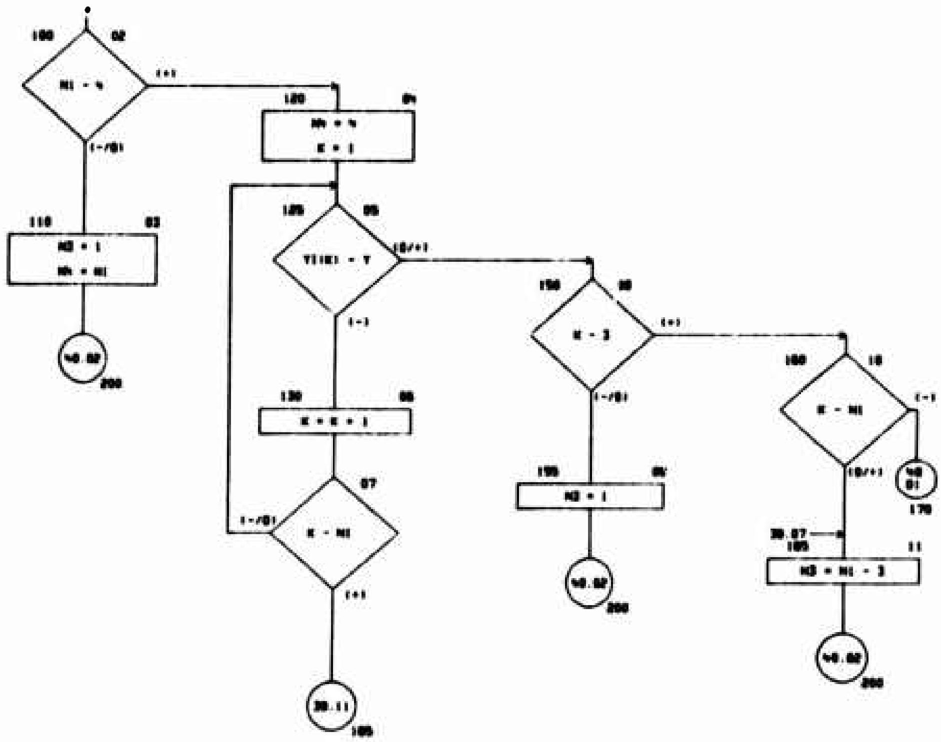


CHART TITLE - FUNCTION FCODM2(X,Y,XI,YI,ZI,N1,N2,NK)

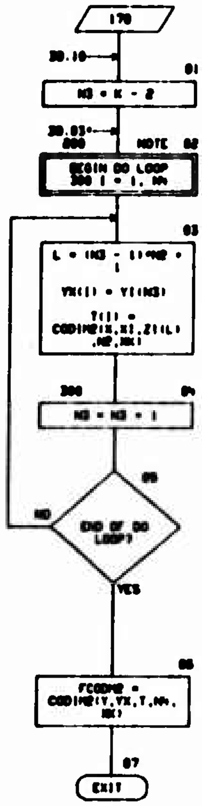


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
COMMON TCOM(4400)
DIMENSION BD(100),ND(200),X1(1),Y1(1),Z1(1),T(4),YX(4)
EQUIVALENCE (BD(1),TCOM(2003)),(ND(1),TCOM(4201)),(T(1),BD(81)),(Y
X(1),BD(85)),(NS,ND(138)),(NN,ND(139)),(I1,ND(140)),(K,ND(141)),(L,
ND(142))
```

CHART TITLE - FUNCTION CODIMP2(X,XI,YI,N,NK)

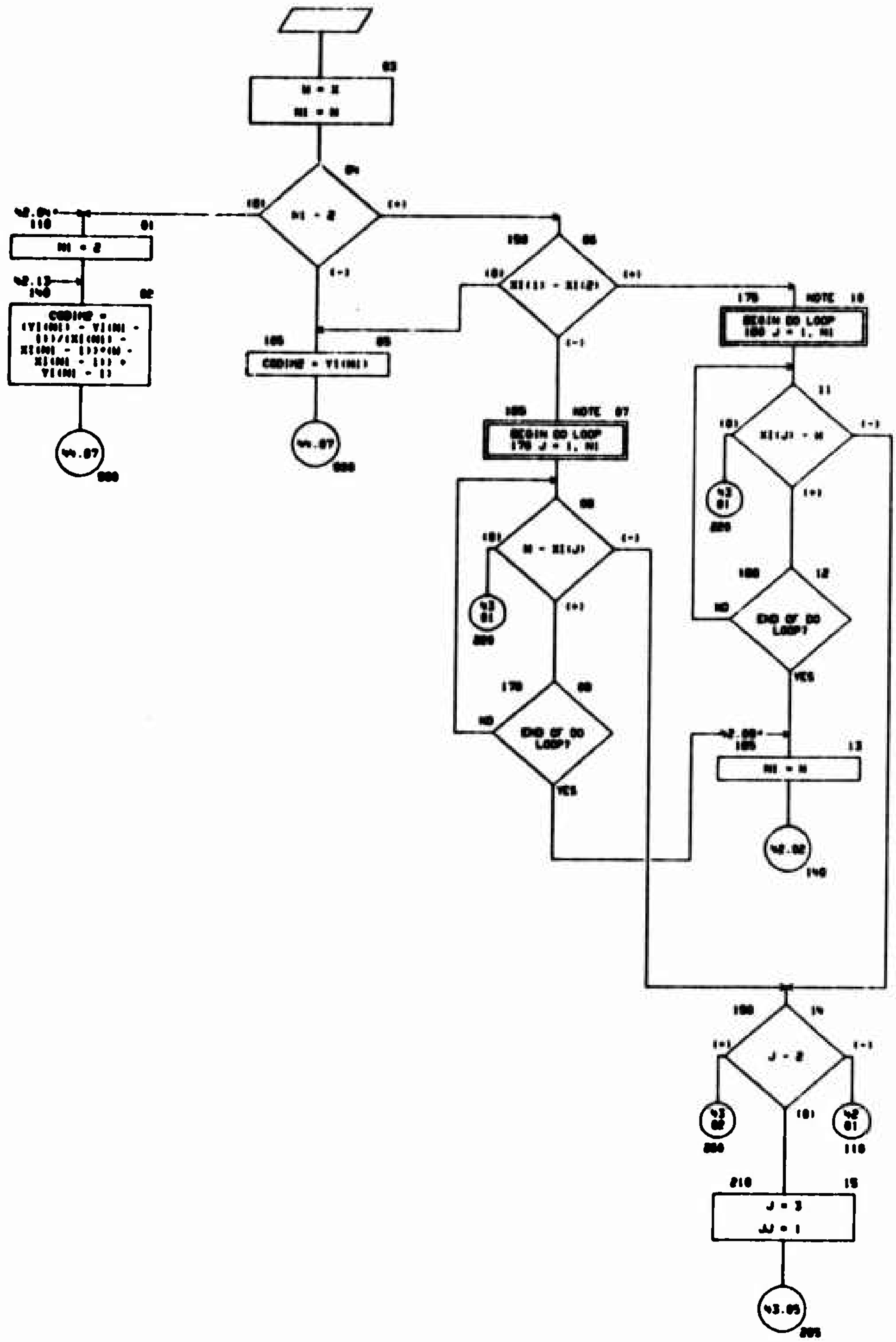


CHART TITLE - FUNCTION CODIM2(X,XI,YI,N,XK)

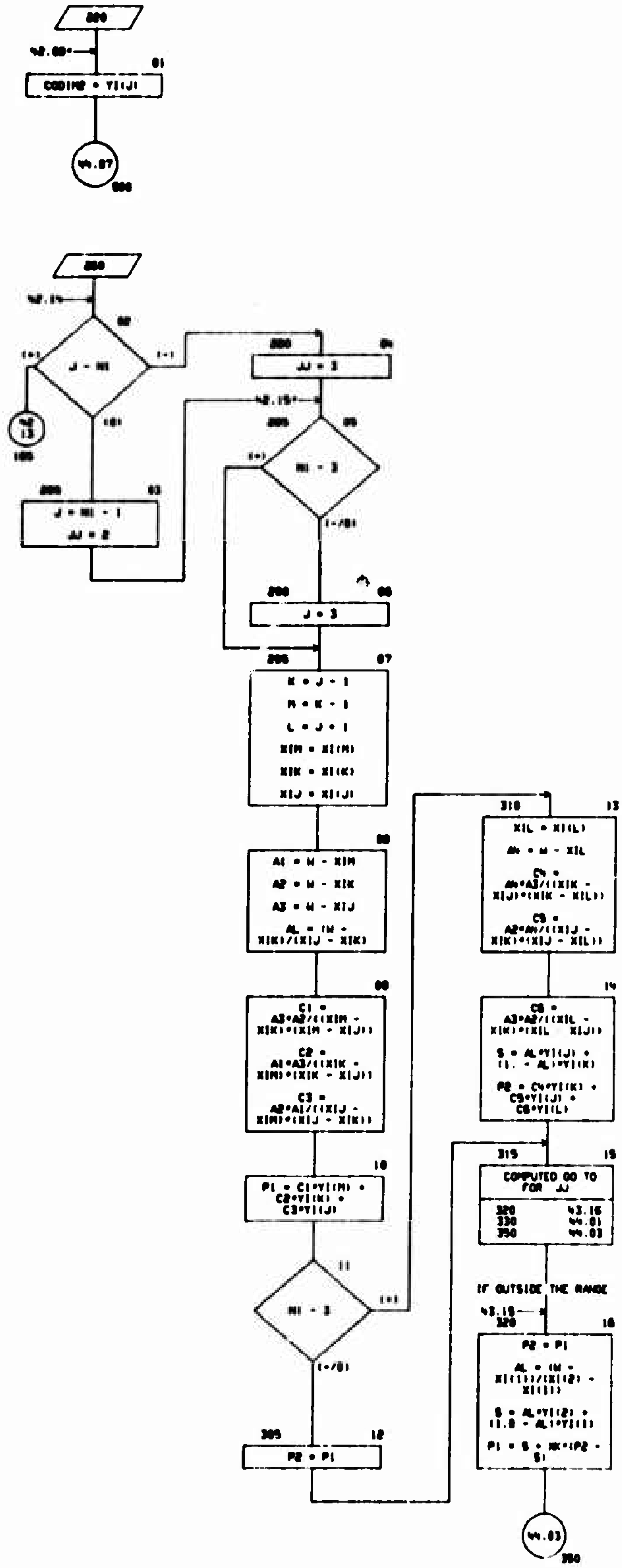


CHART TITLE - FUNCTION CODINP2(X,X1,Y1,N,XK)

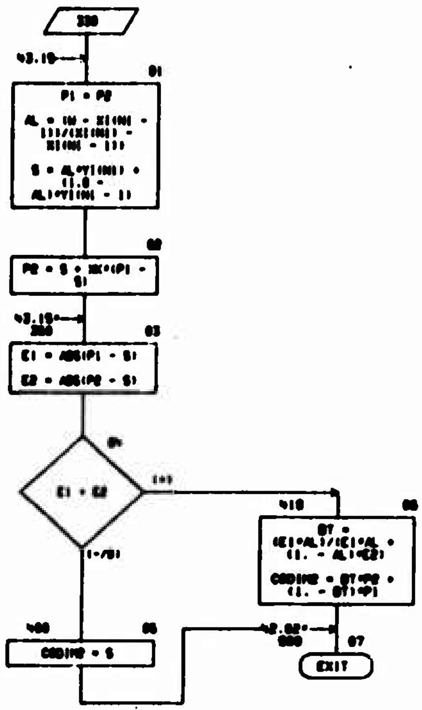


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
COMMON TCOM(400)
DIMENSION ND(200),X(1),Y(1)
EQUIVALENCE (ND(1),TCOM(201)),(NI,ND(193)),(J,ND(194)),(JJ,ND(195
)),(K,ND(196)),(L,ND(197)),(M,ND(198))
```

CHART TITLE - SUBROUTINE WFLEX(AFW,AFWCP,AFWF,AFWDF,F,YCI0J,EI,GJ,CR,DOD,GLDS,A

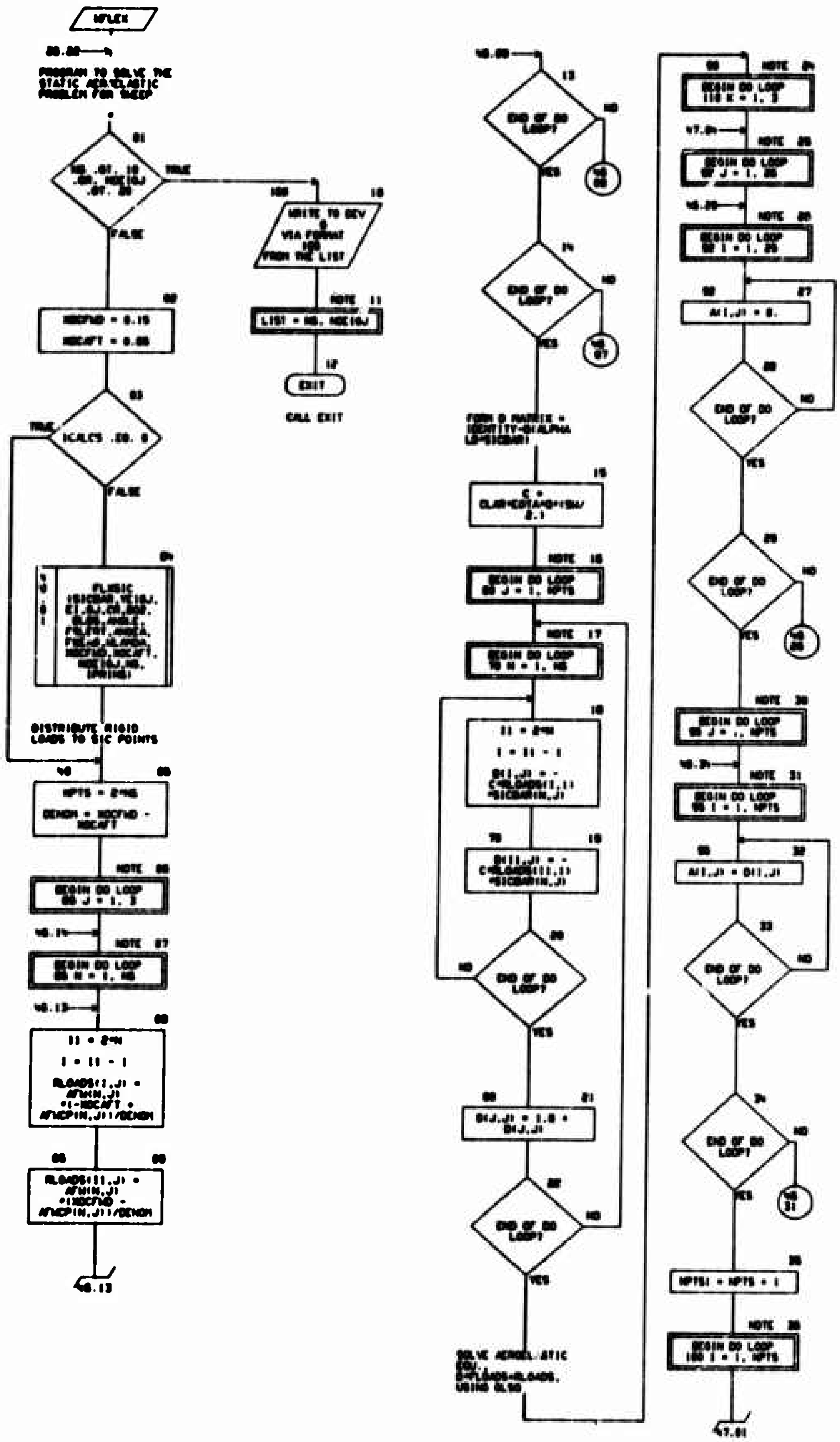


CHART TITLE - SUBROUTINE WFLEX(AFW,AFWCP,AFWF,AFWDF,F,YE(6J,EI,GJ,CR,BO2,BLBS,A

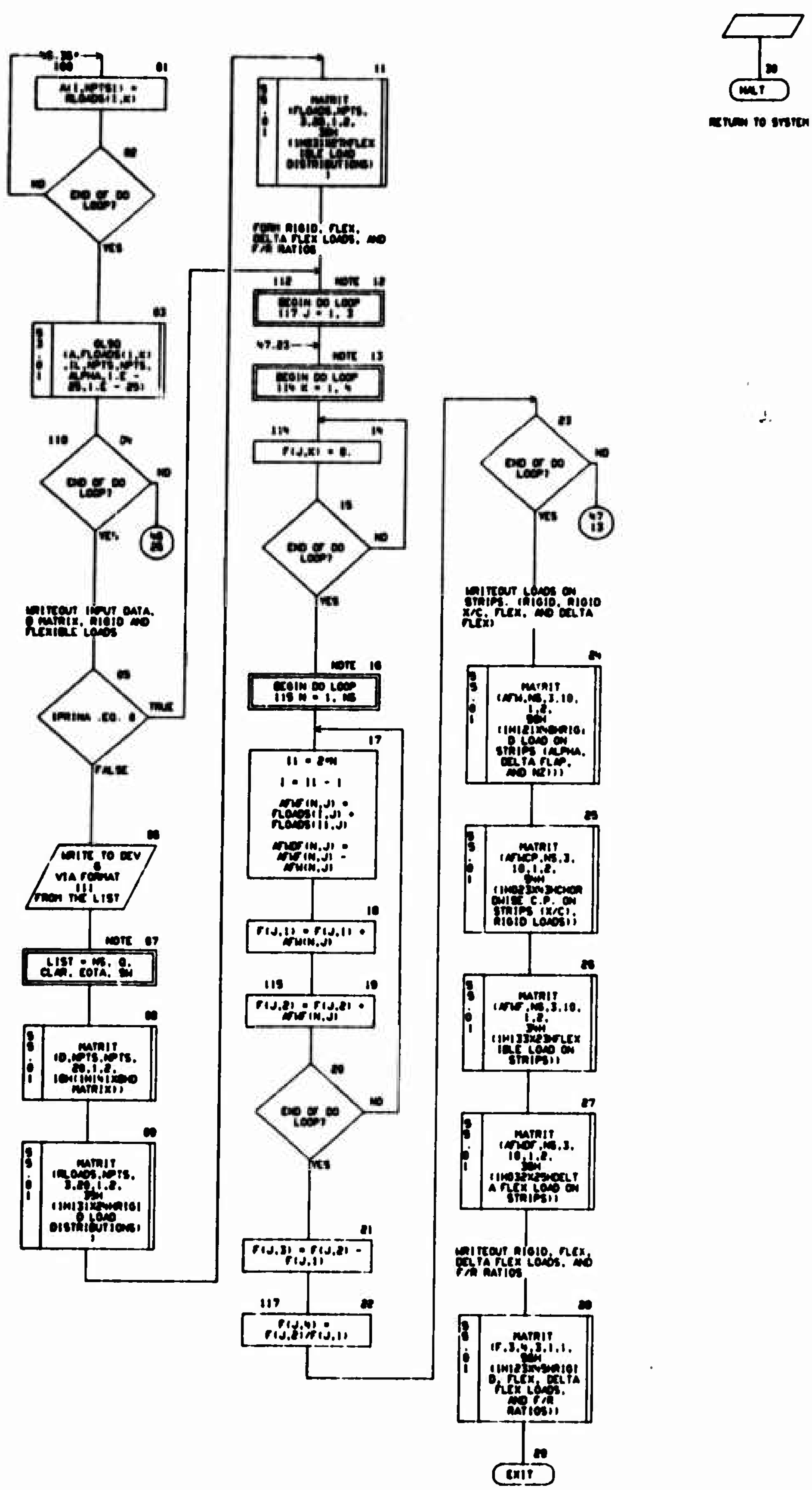


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
          DIMENSION  VEIGJ(20) ,EI(20)    ,GJ(20)     ,SIGBAR(10,20)
          DIMENSION  AFM(10,3) ,AFMCP(10,3),D(20,20) ,RLOADS(20,3),
                     FLOADS(20,3),  BLOADS(20,3)     ,A(20,20)  ,IL(20)    ,
                     AFMF(10,3),F(3,4)    ,AFMDF(10,3)
          COMMON TCOM(4400)
   111    FORMAT (1H1 20X,27H DATA FROM SUBROUTINE WFLEX,//23X, 5H NS =,I13,
          //23X, 4H Q =,1F7.2, 8H LB/FT**2,  //23X, 7H CLAR =,1F6.3,//23X,7H
           BETA =,1F8.4,//23X, 5H SW =,1F7.2 , 8H FT**2 )
   100    FORMAT (28H1 PROGRAM DIMENSIONS EXCEEDED,/ 8H0 NS =,I13,12H     NOE
          IGJ =,I13)
```

CHART TITLE - SUBROUTINE FLXSIC(SICBAR,YEIGJ,EI,GJ,CR,BO2,BLOS,ANGLE,FSLERT,ANG

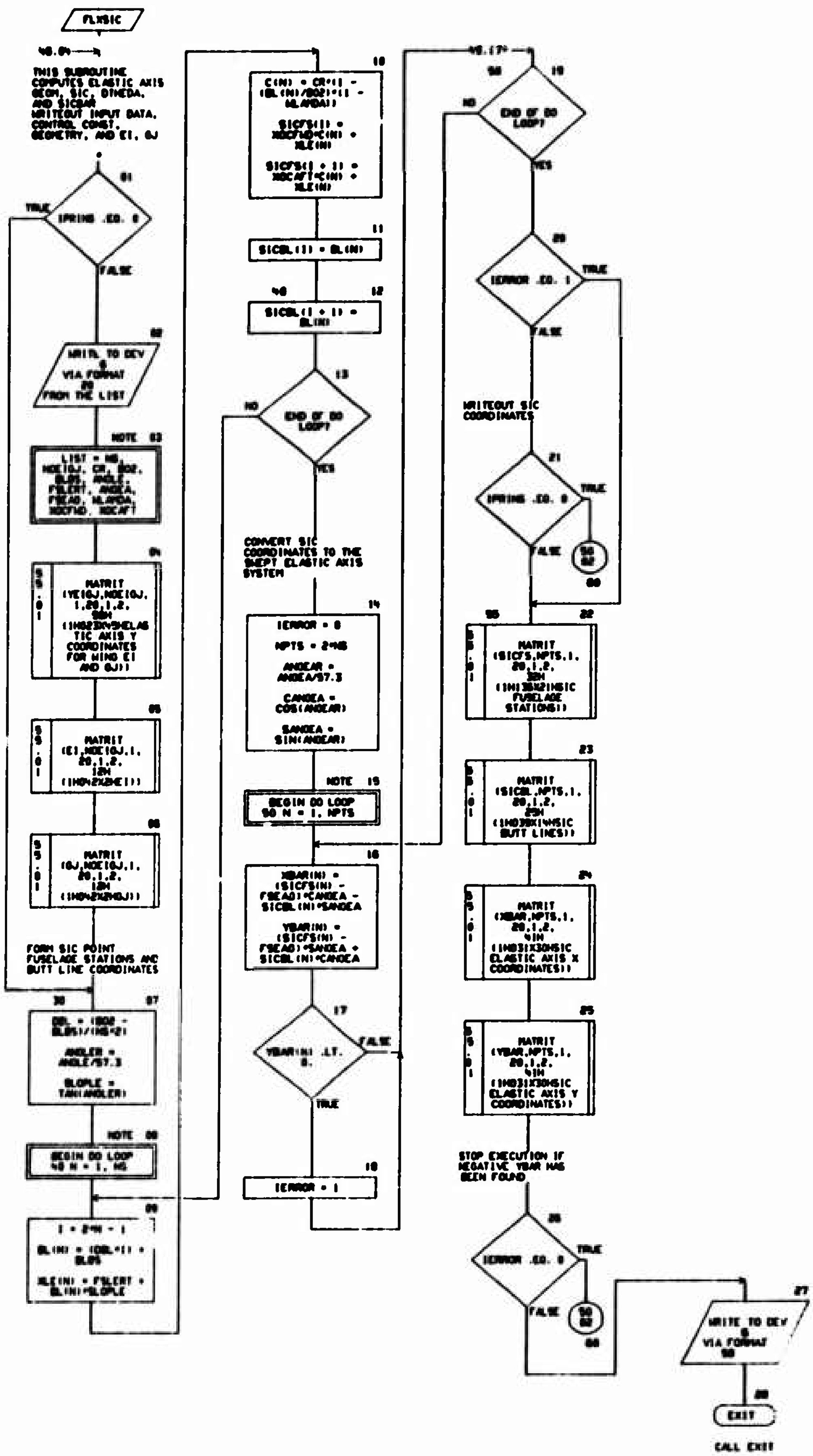


CHART TITLE - SUBROUTINE FLXSIC(SICBAR,YEIGJ,EI,GJ,CR,BO2,BLBS,ANGLE,FSLCRT,ANG

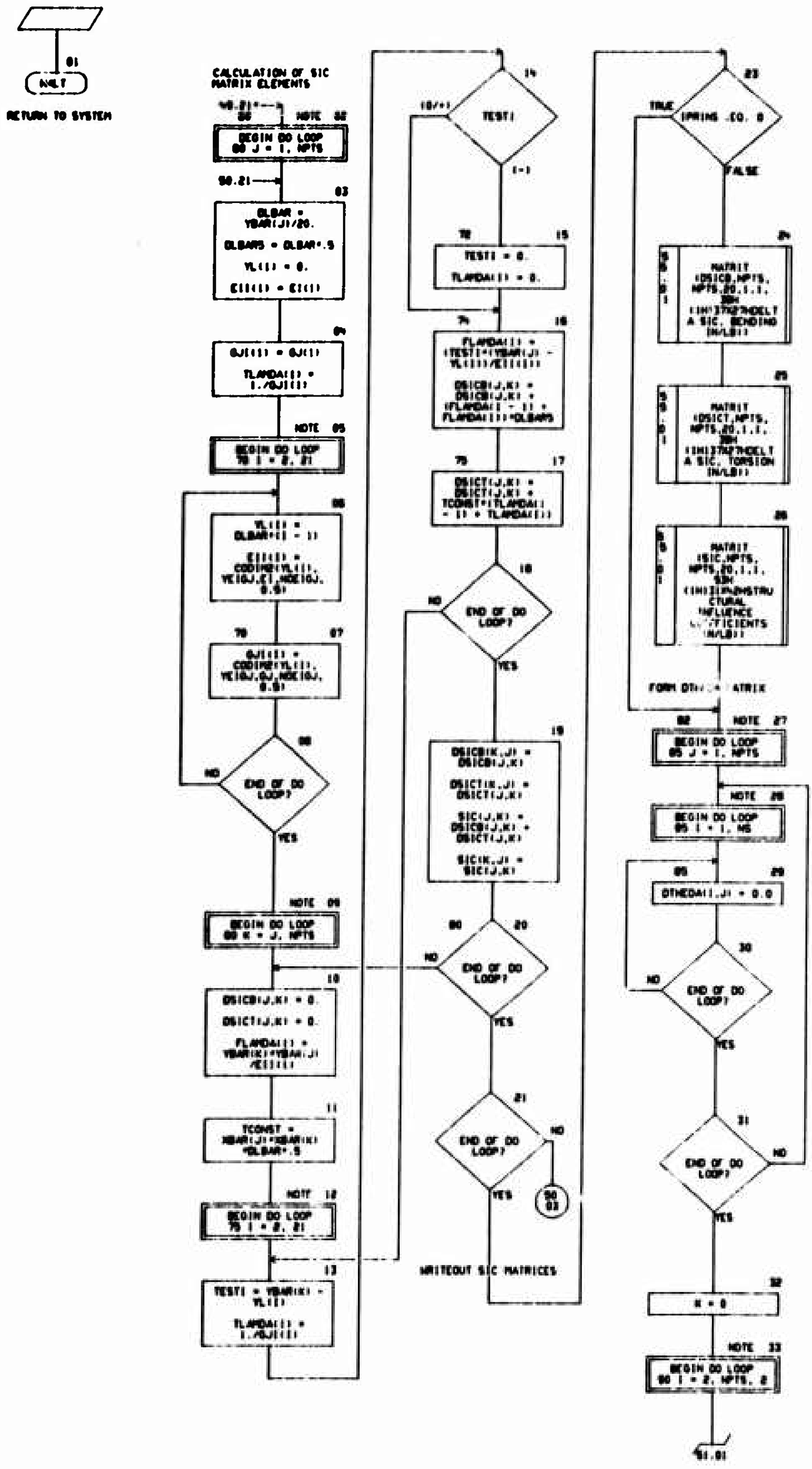
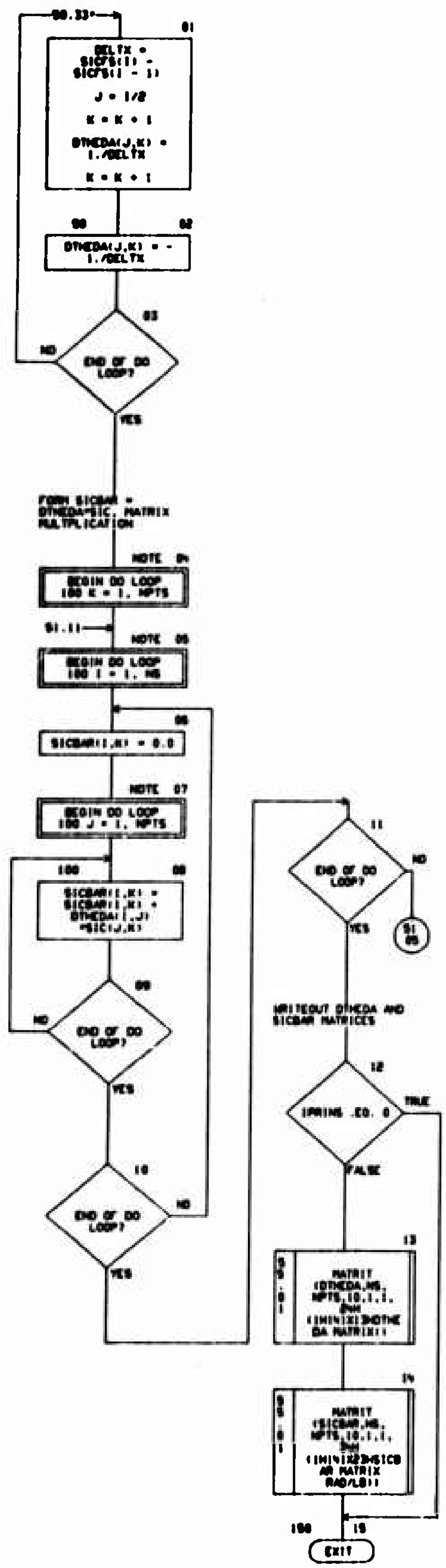


CHART TITLE - SUBROUTINE FLXSIC(SICBAR,YEIGJ,EI,GJ,CR,DOZ,BLDS,ANGLE,FSLERT,ANG



```
          DIMENSION XLE(20)   ,BL(20)    ,C(20)     ,SICFS(20) ,SICBL(20) ,
                    XBAR(20)  ,YBAR(20)
          DIMENSION YL(21)    ,EI1(21)   ,GJ1(21)   ,YEIGJ(20) ,EI(20)    ,
                    GJ(20)    ,FLAMDA(21),DSICB(20,20)   ,DSICT(20,20)    ,
                    SIC(20,20),TLAMDA(21)
          DIMENSION DTHEDA(10,20) ,SICBAR(10,20)
          COMMON TCOM(4400)
 80       FORMAT (1H1 24X,28H DATA FROM SUBROUTINE FLXSIC,/ 9H0    NS =,I13,
           17X,8H NOEIGJ =,I13,/ 9H0    CR =,1F8.2,9H  IN.,  7X,8H BOZ =,1F8.
          2,9H  IN., 6X,7H BLBS =,1F7.2 ,9H  IN.,/ 12H0    ANGLE =,1F7.3,8H
           DEG., 4X,8H FSLERT =,1F8.2,9H  IN.,/ 12H0    ANGEA =,1F7.3,8H  DE
          G., 4X,8H FSEAB =,1F8.2,9H  IN.,/ 13H0    HLAMDA =,1F8.3,10X,9H XO
          CFMD =,1F8.3,10X,9H XOCAFT =,1F8.3)
 90       FORMAT (23H0      EXECUTION STOPPED,/ 81H NEGATIVE VALUE OF Y IN TH
          E SWEPT AXIS SYSTEM HAS BEEN FOUND IN SUBROUTINE FLXSIC )
```

CHART TITLE - SUBROUTINE ELSO(A,X,IL,N,M,ALPHA,E1,E2)

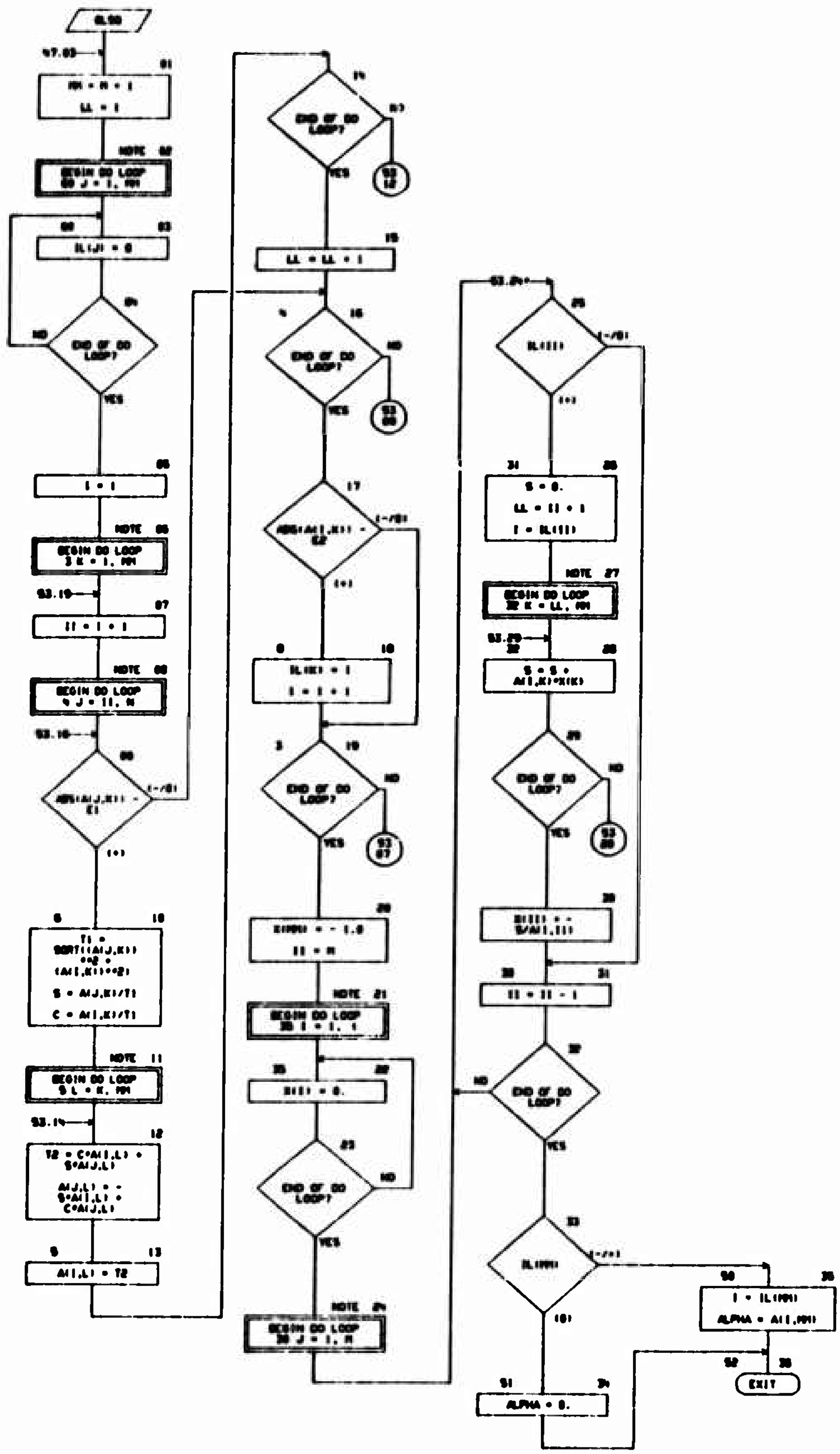


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
DIMENSION A(25,26),X(26),IL(26)
```

CHART TITLE - SUBROUTINE MATRIT(ARM,NR,NC,NRMAX,MTYPE,IPRIN,HEAD)

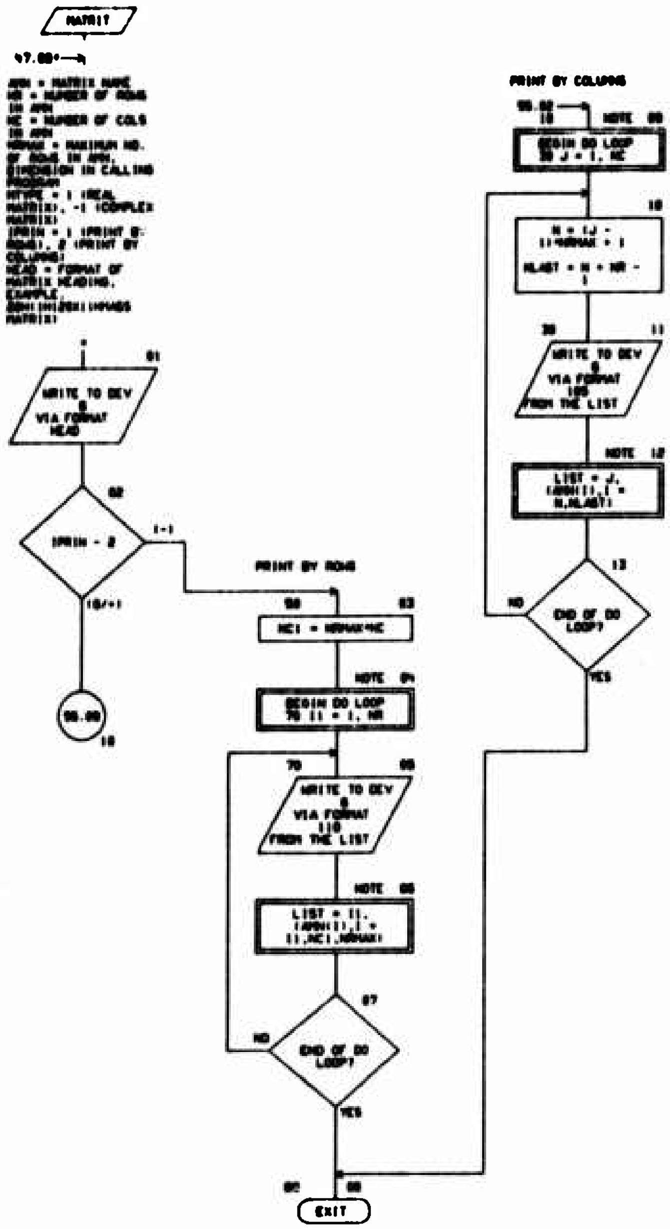


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
          DIMENSION  A(N,1),HEAD(100)
   105    FORMAT(1H0,5X,12HCOLUMN NO. =I4//(1H 1P8E13.5))
   110    FORMAT(1H0,5X,9HROW NO. =I4//(1H 1P8E13.5))
```

CHART TITLE - SUBROUTINE BALDSF

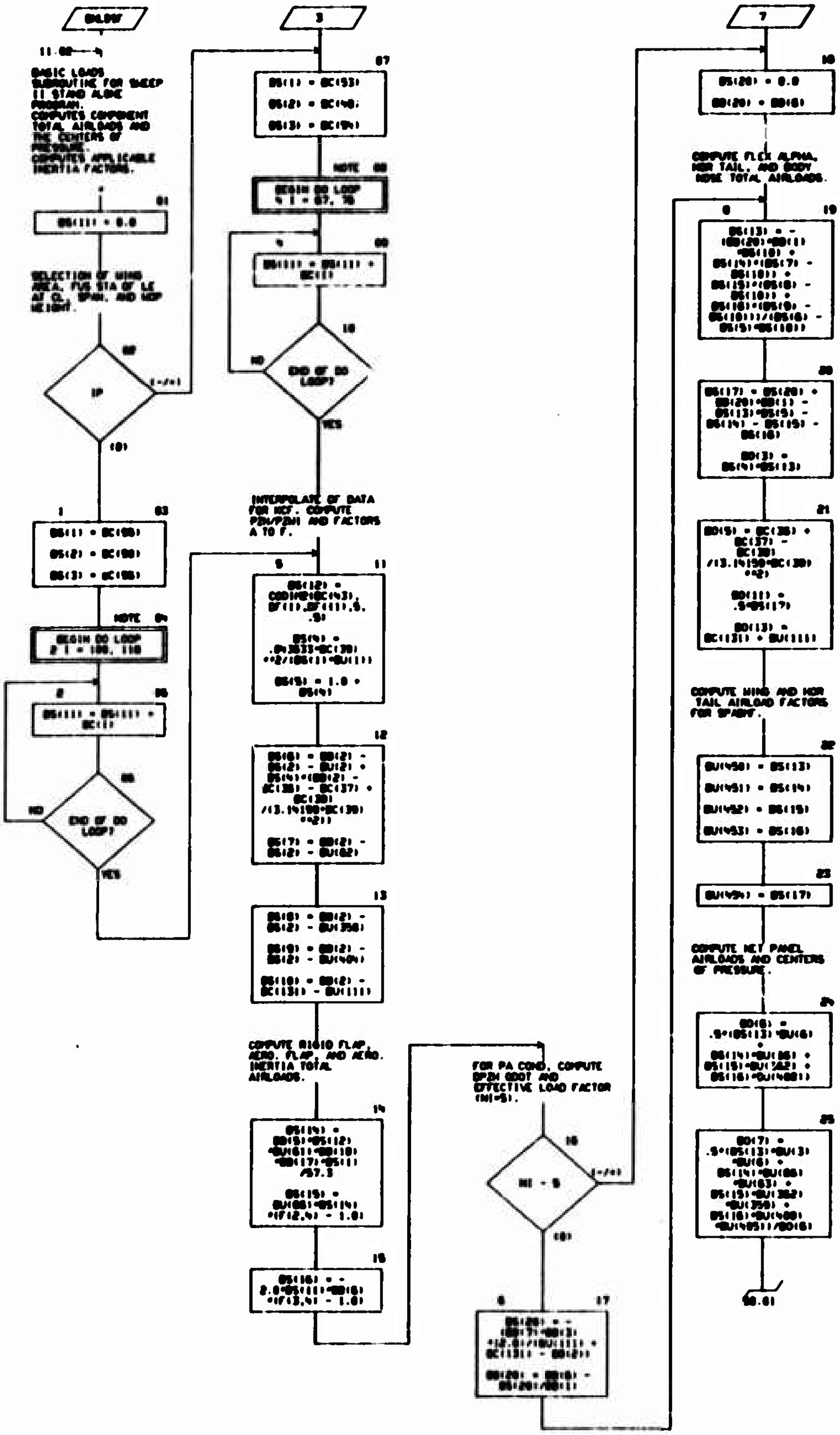


CHART TITLE - SUBROUTINE

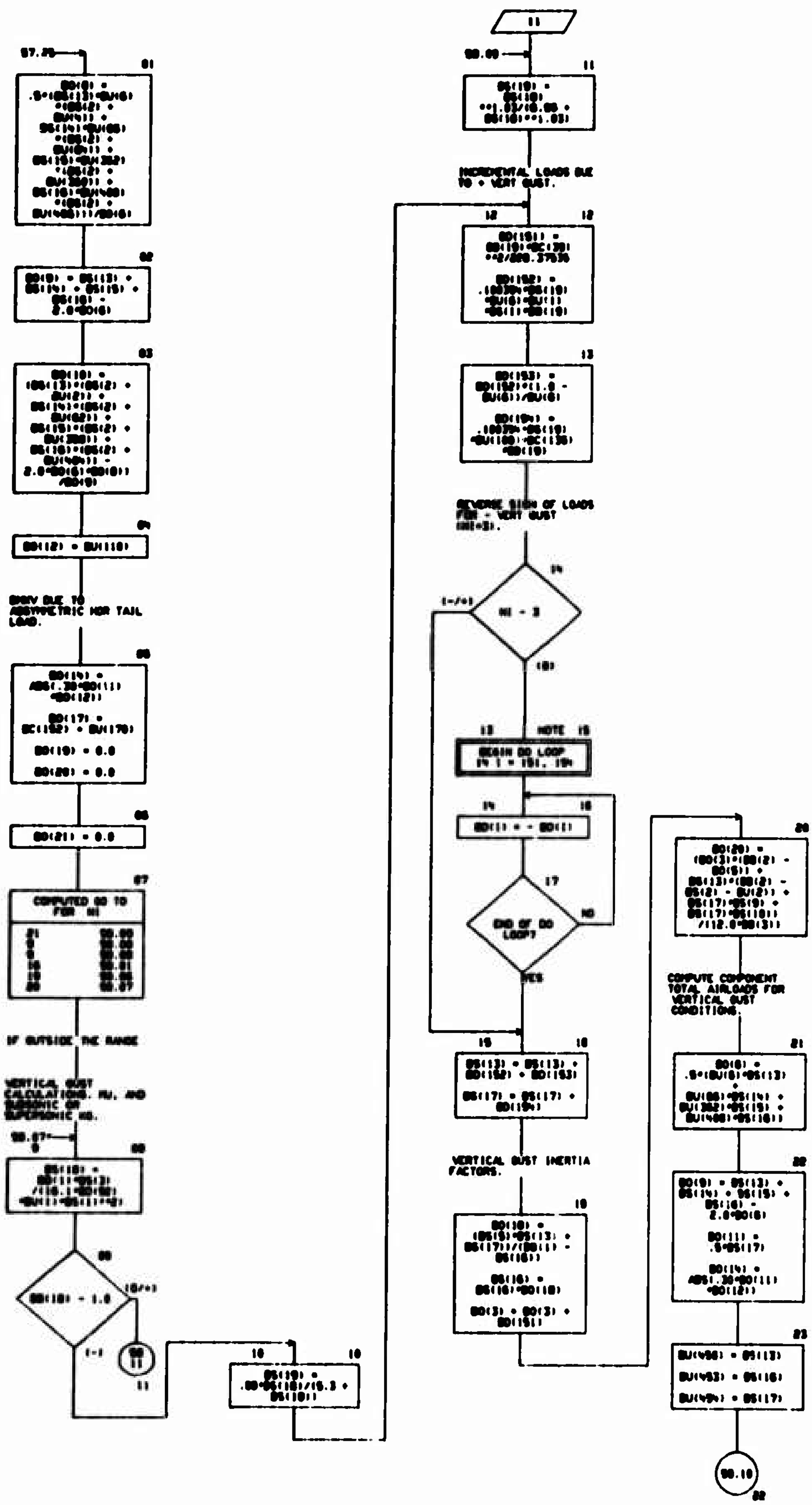


CHART TITLE - SUBROUTINE BKLDSF

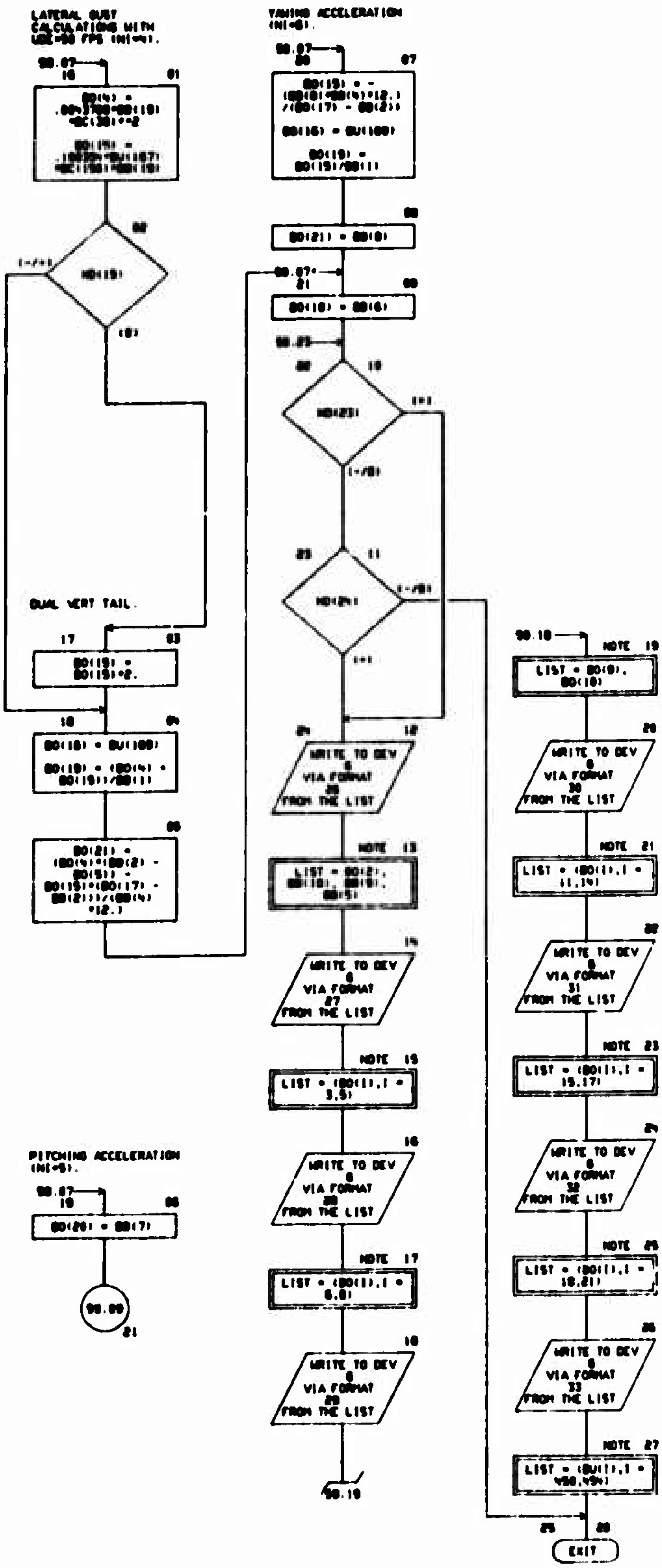


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
          COMMON TCOM(4400)
          DIMENSION BF(146),BC(150),BB(20),BS(20),BD(160),BU(500),BO(346),ND
         (200),F(3,4)
          EQUIVALENCE (BF(1),TCOM(1000)),(BC(1),TCOM(2780)),(BB(1),TCOM(2853
         )),(BS(1),TCOM(2873)),(BD(1),TCOM(2893)),(BU(1),TCOM(3153)),(BO(1)
         ,TCOM(3653)),(ND(1),TCOM(4201)),(F(1,1),BU(346)),(NI,ND(186)),(IP,
         ND(137)),(NT,ND(150)),(I,ND(151)),(J,ND(152)),(K,ND(153))
26        FORMAT(1H1GX13HCONDITION NO=F7.0,5X3HW=F8.3,5HALT=F7.0,5X3HQF=F
         6.2)
27        FORMAT(1H0SX10HBODY LOADS/7X4HPZN=F8.0,4X4HPYN=F7.0,4X4HMXN=F8.2/)
28        FORMAT(1H0SX15HWING PANEL LOAD/7X8HPZW(B)/2=F8.0,4X7HMYBW(B)=F7.2,4
         X7HMXBW(B)=F8.2/)
29        FORMAT(1H0SX20HWING CARRY-OVER LOAD/7X7HPZB(W)=F8.0,4X7HMXB(W)=F8.
         2/)
30        FORMAT(1H0SX21HHORIZONTAL TAIL LOADS/7X6HPZH/2=F8.0,4X5HMYBH=F8.2,4
         X5HMXBH=F8.2,4X6HCMBH=F8.0/)
31        FORMAT(1H0SX19HVERTICAL TAIL LOAD/7X4HPYV=F8.0,4X5HMZBV=F8.2,4X5HMXB
         V=F8.2/)
32        FORMAT(1H0SX24HAIRPLANE INERTIA FACTORS/7X3HNZ=F8.2,4X3HNY=F8.2,4X
         5HQDOT=F7.3,4X5HRDOT=F7.3/)
33        FORMAT(1H0SX26HCOMPONENT SPANWISE FACTORS/7X6HPZW1=F8.0,5X6HPZW2
         =F8.0,5X6HPZW3=F8.0,5X6HPZW4=F8.0,5X5HPZB=F8.0)
```

CHART TITLE - SUBROUTINE SPABNF

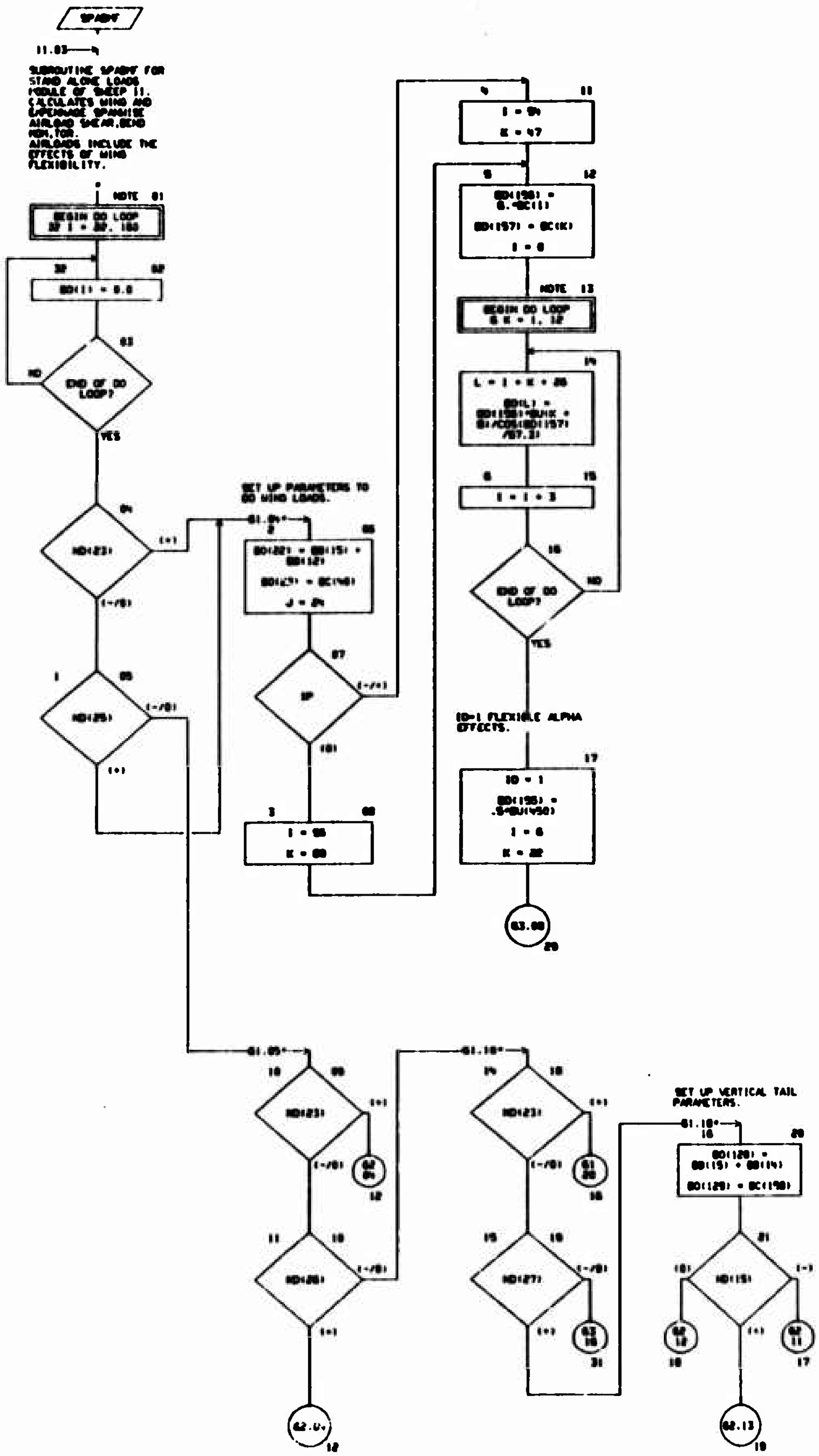


CHART TITLE - SUBROUTINE SPANT

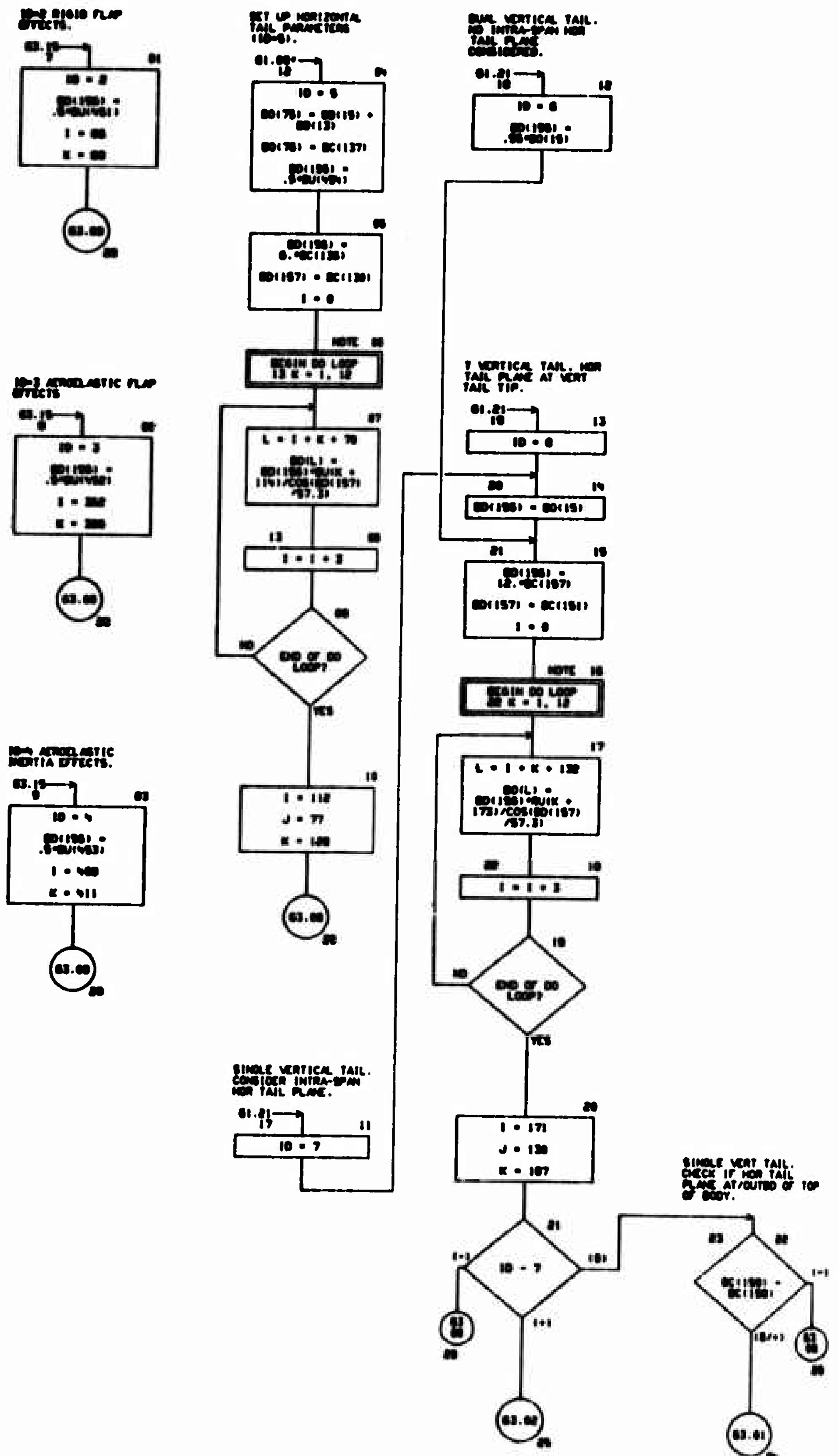


CHART TITLE - SUBROUTINE SPABNT

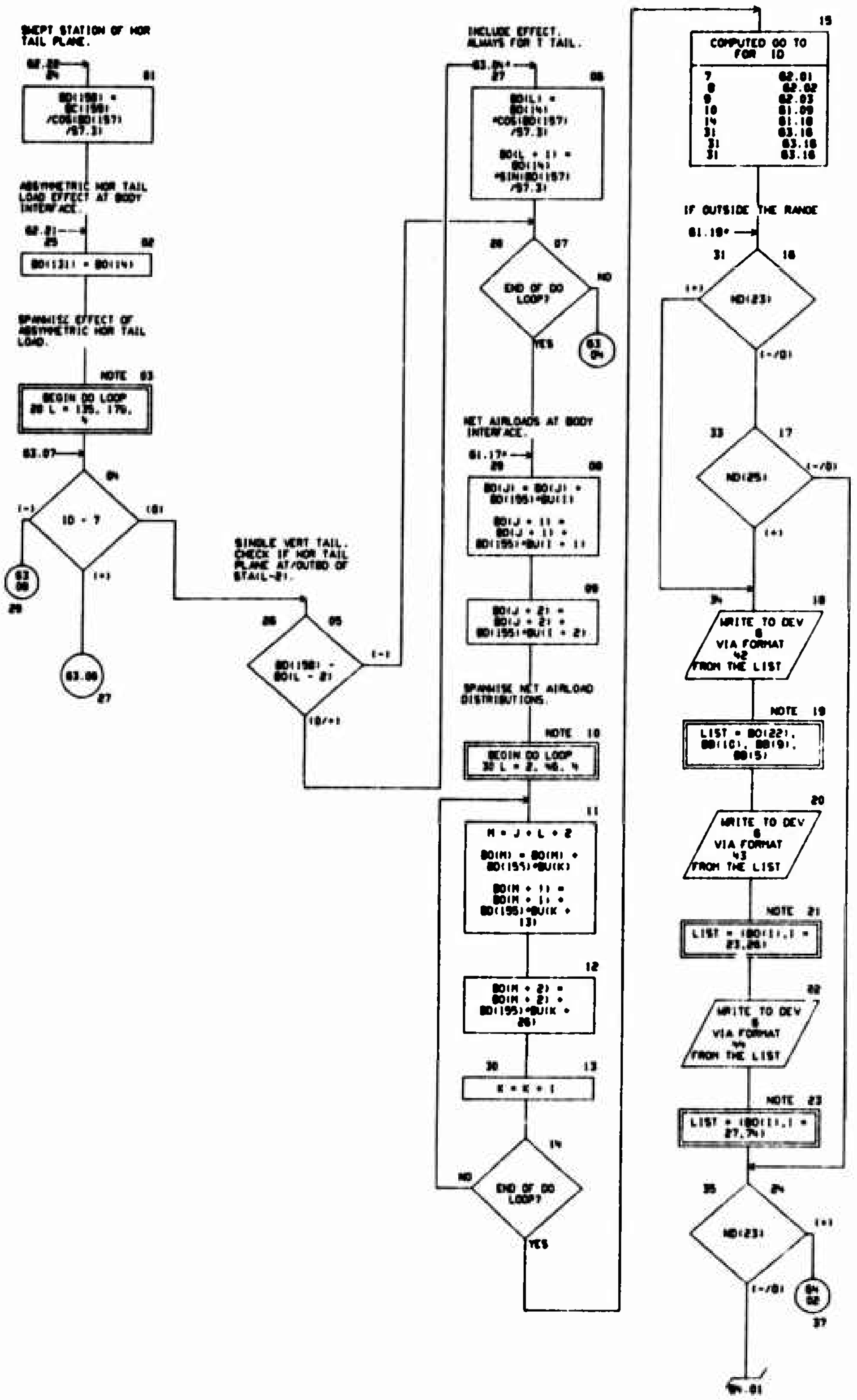


CHART TITLE - SUBROUTINE

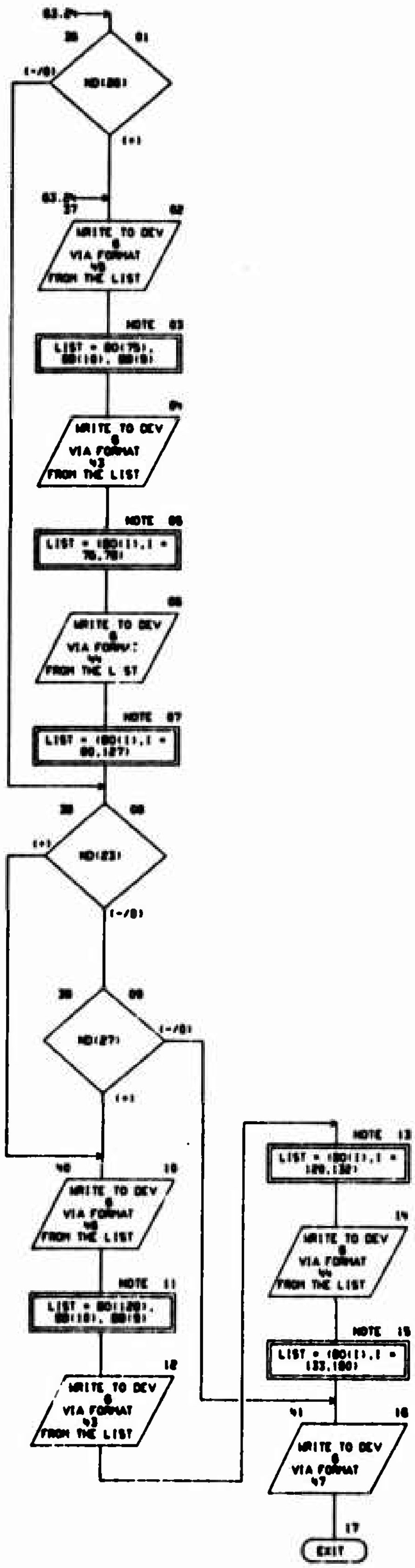


CHART TITLE - NON-PROCEDURAL STATEMENTS

```
          COMMON TCOM(4400)
          DIMENSION BB(20),BC(195),BD(340),BO(160),BU(500),ND(200)
          EQUIVALENCE (BC(1),TCOM(2750)),(BB(1),TCOM(2953)),(BD(1),TCOM(2993
          )),(BU(1),TCOM(3153)),(BO(1),TCOM(3853)),(ND(1),TCOM(4201)),(IP,ND
          (137)),(ID,ND(194)),(I,ND(195)),(J,ND(196)),(K,ND(157)),(L,ND(198)
          ),(N,ND(199))
42        FORMAT(1H13X10HWING LOADS3X8HCOND NO=F7.0,3X3HN=F8.3,5X4HALT=F7.0
          ,5X3HEF=F6.2)
43        FORMAT(1H03X9HBODY INT=F7.2,2X1HN4X10HSHEAR SOD=F8.0,2HLB4X10HBENDM
           SOD=F10.0,5HIN-LB4X10HTORSN SOD=F10.0,5HIN-LB///13X7HSTATION18X5H
          SHEAR16X8HBEND MOM21X8HTORS MOM/14X4H(IN)21X4H(LB)19X7H(IN-LB)22X7
          H(IN-LB)/)
44        FORMAT(1H F10.2,F24.0,F26.0,F29.0)
45        FORMAT(1H13X21HHORIZONTAL TAIL LOADS3X8HCOND NO=F7.0,3X3HN=F8.3,5
          X4HALT=F7.0)
46        FORMAT(1H13X19HVERTICAL TAIL LOADS3X8HCOND NO=F7.0,3X3HN=F8.3,5X4
          HALT=F7.0)
47        FORMAT(1H1)
```

FORTRAN MODULE (LIST,EBCDIC)

```
CARD NO  ****                         CONTENTS                         ****

          C     BFCNTL IS THE STAND ALONE FLEXIBLE LOADS CONTROL PROGRAM.      BFCNT001
          C     DETERMINES BASIC AIRLOAD CONDITIONS TO BE COMPUTED FOR A SPECIFIEDBFCNT002
          C     SPEED-ALTITUDE CASE.                                           BFCNT003
          C     IT PROVIDES LOGIC AND CONTROL FUR THE AIRLOAD SUBROUTINES.     BFCNT004
                COMMON TCOM(4400)                                              BFCNT005
                DIMENSION ND(200),BD(240),BC(195),BB(20),DT(56),DB(853),DF(146),DPBFCNT010
               1(734),BF(200),BU(500)                                          BFCNT011
                EQUIVALENCE (ND(1),TCOM(4201)),(BB(1),TCOM(3953)),(BC(1),TCOM(2758BFCNT020
               1)),(BD(1),TCOM(2003)),(BF(1),TCOM(4001)),(DT(1),TCOM(1001)),(DB(1),BFCNT021
               2TCOM(1951)),(DF(1),TCOM(1001)),(DP(1),TCOM(1195)),(I,ND(101)),(J,NDBFCNT022
               3(102)),(IC,ND(103)),(IDC,ND(104)),(IR,ND(107)),(NI,ND(106)),(NF,NDBFCNT023
               4(108)),(BU(1),TCOM(3193)),(ICALCS,ND(105)),(NEG,ND(42)),(NC,ND(100BFCNT024
               5))                                                             BFCNT025
                DO 57 I=455,495                                                BFCNT026
             57 BU(I)=0.0                                                      BFCNT028
                DO 1 I=1,195                                                   BFCNT030
              1 BC(I)=0.0                                                      BFCNT032
              3 READ(5,4)(ND(I),I=12,46)                                       BFCNT040
              4 FORMAT(35I2)                                                   BFCNT041
                IR=-1                                                          BFCNT043
                CALL REDDAT                                                    BFCNT045
                CALL DECRD (DT)                                                BFCNT050
                CALL DECRD (DB)                                                BFCNT055
                CALL DECRD (DF)                                                BFCNT060
                CALL DECRD (DP)                                                BFCNT065
                DO 5 I=100,131                                                 BFCNT075
              5 ND(I)=0                                                        BFCNT077
                NC=ND(46)                                                      BFCNT080
          C     SET UP REQUIRED CONDITIONS MAP.                                BFCNT083
                GO TO (7,7,7,16,16,16,7,25,26,7,7),NC                          BFCNT085
          C     POSITIVE NZ CONDITIONS.                                        BFCNT090
              7 IF(ND(20))16,16,8                                              BFCNT095
              8 IF(NC-2)11,12,9                                                BFCNT100
              9 IF(NC-7)13,11,10                                               BFCNT105
             10 IF(NC-11)14,15,16                                              BFCNT110
             11 ND(112)=1                                                      BFCNT115
             12 ND(116)=1                                                      BFCNT120
             13 ND(120)=1                                                      BFCNT125
                IF(NC-3)37,37,16                                               BFCNT130
             14 ND(128)=1                                                      BFCNT135
             15 ND(130)=1                                                      BFCNT140
          C     NEGATIVE NZ CONDITIONS.                                        BFCNT145
             16 IF(ND(20))27,27,17                                             BFCNT150
             17 IF(NC-5)20,21,18                                               BFCNT155
             18 IF(NC-7)22,20,19                                               BFCNT160
             19 IF(NC-11)23,24,27                                              BFCNT165
             20 ND(113)=1                                                      BFCNT170
             21 ND(117)=1                                                      BFCNT173
             22 ND(121)=1                                                      BFCNT175
                IF(NC-6)27,27,37                                               BFCNT178
             23 ND(129)=1                                                      BFCNT180
             24 ND(131)=1                                                      BFCNT183
                GO TO 27                                                       BFCNT184
          C     MANEUVERING FLAP DOWN CONDITION.                               BFCNT188
             25 ND(124)=1                                                      BFCNT190
                GO TO 90                                                       BFCNT193
          C     FLAP DOWN 1G TRIM CONDITION.                                   BFCNT195
             26 ND(125)=1                                                      BFCNT198
                GO TO 90                                                       BFCNT200
          C     POSITIVE VERTICAL GUST CONDITIONS.                             BFCNT203
             27 IF(ND(32))31,31,28                                             BFCNT205
             28 IF(NC-10)29,30,30                                              BFCNT208
             29 ND(109)=1                                                      BFCNT210
                GO TO 31                                                       BFCNT213
             30 ND(108)=1                                                      BFCNT215
          C     NEGATIVE VERTICAL GUST CONDITIONS.                             BFCNT218
             31 IF(ND(33))35,35,32                                             BFCNT220
             32 IF(NC-10)33,34,34                                              BFCNT223
             33 ND(110)=1                                                      BFCNT225
                GO TO 35                                                       BFCNT228
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CARD NO      ****                    CONTENTS                    ****
         34 ND(27)=1                                             GFCNT230
            GO TO 90                                             GFCNT233
      C     LATERAL GUST CONDITIONS.                             GFCNT236
         35 IF(ND(34))90,90,36                                   GFCNT238
         36 ND(11)=1                                             GFCNT240
            GO TO 90                                             GFCNT243
      C     PITCHING ACCELERATION CONDITIONS.                    GFCNT246
         37 IF(ND(35))43,43,38                                   GFCNT248
         38 IF(NC-2)40,41,39                                     GFCNT250
         39 IF(NC-7)42,40,90                                     GFCNT253
         40 ND(14)=1                                             GFCNT256
         41 ND(18)=1                                             GFCNT258
         42 ND(22)=1                                             GFCNT260
      C     YAWING ACCELERATION CONDITIONS.                      GFCNT263
         43 IF(ND(36))90,90,44                                   GFCNT266
         44 IF(NC-2)46,47,45                                     GFCNT268
         45 IF(NC-7)48,46,90                                     GFCNT270
         46 ND(15)=1                                             GFCNT273
         47 ND(19)=1                                             GFCNT276
         48 ND(23)=1                                             GFCNT278
      C     CONDITION PARAMETERS. REGION (BB).                   GFCNT280
         90 BB(11)=0.0                                           GFCNT285
            BB(13)=4.0                                           GFCNT290
            BB(14)=ND(15)+6                                      GFCNT295
            BB(16)=0.0                                           GFCNT300
            DO 127 I=1,23                                        GFCNT305
            IF(ND(I+100))127,127,60                              GFCNT310
         60 DO 2 J=1,21                                          GFCNT312
          2 BB(J)=0.0                                            GFCNT314
            GO TO (73,73,73,80,80,80,80,80,80,80,80,70,70,70,70,61,64,77,77,71GFCNT316
           1,71,72,72),I                                         GFCNT318
      C     CASE 8 (FLAP DOWN MANEUVER) PARAMETERS.              GFCNT320
         61 BB(1)=GC(1)                                          GFCNT322
            BB(6)=GC(10)                                         GFCNT324
            BB(10)=1.5*GC(34)/GG1.3                              GFCNT326
            IF(ND(14))62,62,63                                   GFCNT328
         62 BB(2)=GC(3)                                          GFCNT330
            GO TO 65                                             GFCNT332
         63 BB(2)=GC(2)                                          GFCNT334
            GO TO 65                                             GFCNT336
      C     CASE 9 (FLAPS DOWN 1.0G TRIM) PARAMETERS.            GFCNT340
         64 BB(1)=GC(11)                                         GFCNT342
            BB(2)=GC(12)                                         GFCNT344
            BB(8)=1.0                                            GFCNT346
            BB(10)=1.2*GC(35)/GG1.3                              GFCNT348
         65 BB(3)=0.0                                            GFCNT350
            BB(4)=0.0                                            GFCNT352
            BB(5)=GC(44)                                         GFCNT354
            BB(7)=0.0                                            GFCNT356
            BB(8)=0.0                                            GFCNT358
            BB(9)=0.0                                            GFCNT360
            IF(ND(14))66,66,67                                   GFCNT362
         66 BB(12)=1.0                                           GFCNT364
            GO TO 112                                            GFCNT366
         67 BB(12)=2.0                                           GFCNT368
            GO TO 112                                            GFCNT370
      C     FLAPS UP CONDITION ALTITUDE.                         GFCNT372
         68 BB(9)=GC(19)                                         GFCNT374
            GO TO 80                                             GFCNT376
         69 BB(9)=GC(20)                                         GFCNT378
            GO TO 80                                             GFCNT380
         70 BB(9)=GC(21)                                         GFCNT382
            GO TO 80                                             GFCNT384
         71 BB(9)=GC(29)                                         GFCNT386
            GO TO 80                                             GFCNT388
         72 BB(9)=GC(30)                                         GFCNT390
            GO TO 80                                             GFCNT392
         73 IF(NC-5)80,74,75                                     GFCNT394
         74 IF(GC(20)-20000.)169,76,76                           GFCNT396
         75 IF(GC(21)-20000.)170,76,76                           GFCNT398
      C     NH GUST AT 20000 FT. WING FIXED OR VARIABLE AFT.     GFCNT400
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CARD NO   ****                       CONTENTS                              ****
 142         75 BB(9)=20000.                                            BFCNT402
 143            BB(10)=BC(30)                                           BFCNT404
 144            GO TO 90                                                BFCNT406
 145         77 IF(NC-11)71,78,78                                       BFCNT408
 146         78 IF(BC(30)-20000.)72,79 79                               BFCNT410
 147       C    MH GUST AT 20000 FT. WING VARIABLE FORWARD.             BFCNT412
 148         79 BB(9)=20000.                                            BFCNT414
 149            BB(10)=BC(33)                                           BFCNT416
 150            GO TO 90                                                BFCNT418
 151         80 GO TO (81,82,83,84,85,86,87,112,112,88,89),NC           BFCNT420
 152       C    FLAPS UP CONDITION MACH NUMBER.                         BFCNT422
 153         81 BB(10)=BC(25)                                           BFCNT424
 154            GO TO 90                                                BFCNT426
 155         82 BB(10)=BC(26)                                           BFCNT428
 156            GO TO 90                                                BFCNT430
 157         83 BB(10)=BC(27)                                           BFCNT432
 158            GO TO 90                                                BFCNT434
 159         84 BB(10)=BC(22)                                           BFCNT436
 160            GO TO 90                                                BFCNT438
 161         85 BB(10)=BC(23)                                           BFCNT440
 162            GO TO 90                                                BFCNT442
 163         86 BB(10)=BC(24)                                           BFCNT444
 164            GO TO 90                                                BFCNT446
 165         87 BB(10)=.90                                              BFCNT448
 166            GO TO 90                                                BFCNT450
 167         88 BB(10)=BC(31)                                           BFCNT452
 168            GO TO 90                                                BFCNT454
 169         89 BB(10)=BC(32)                                           BFCNT456
 170       C    FLAPS UP CONDITION WT,CG,INERTIA FACTORS, AND WING ID.  BFCNT458
 171         90 BB(1)=BC(4)                                             BFCNT460
 172            BB(11)=0.0                                              BFCNT462
 173            IF(ND(14))91,91,93                                      BFCNT464
 174         91 BB(12)=1.0                                              BFCNT466
 175         92 BB(2)=BC(6)                                             BFCNT468
 176            BB(3)=BC(8)                                             BFCNT470
 177            BB(4)=BC(10)                                            BFCNT472
 178            GO TO 95                                                BFCNT474
 179         93 IF(NC-10)94,95,95                                       BFCNT476
 180         94 BB(12)=3.0                                              BFCNT478
 181            GO TO 92                                                BFCNT480
 182         95 BB(2)=BC(5)                                             BFCNT482
 183            BB(3)=BC(7)                                             BFCNT484
 184            BB(4)=BC(9)                                             BFCNT486
 185            BB(12)=2.0                                              BFCNT488
 186         96 BB(7)=0.0                                               BFCNT490
 187            BB(8)=0.0                                               BFCNT492
 188            IF(I-6)100,98,97                                        BFCNT493
 189         97 IF(I-15)6,99,100                                        BFCNT494
 190          6 J=I-6                                                   BFCNT495
 191            GO TO (98,100,100,98,99,100,100,98),J                   BFCNT496
 192         98 BB(7)=BC(17)                                            BFCNT498
 193            GO TO 100                                               BFCNT500
 194         99 BB(8)=BC(18)                                            BFCNT502
 195       C    VERTICAL LOAD FACTOR (NZ).                              BFCNT504
 196        100 GO TO (107,107,107,101,105,109,107,101,105,109,107,101,105,109,107BFCNT506
 197           1,112 112,107,107,101,105,101,105),I                     BFCNT508
 198        101 IF(BB(10)-1.0)102,103,103                               BFCNT510
 199        102 BB(6)=BC(13)                                            BFCNT512
 200            GO TO 112                                               BFCNT514
 201        103 BB(6)=BC(14)                                            BFCNT516
 202            GO TO 112                                               BFCNT518
 203        105 BB(6)=BC(15)                                            BFCNT520
 204            GO TO 112                                               BFCNT522
 205        107 BB(6)=1.0                                               BFCNT526
 206            GO TO 112                                               BFCNT528
 207        109 IF(BB(10)-1.0)110,111,111                               BFCNT532
 208        110 BB(6)=.5*BC(13)                                         BFCNT534
 209            GO TO 112                                               BFCNT536
 210        111 BB(6)=.5*BC(14)                                         BFCNT538
 211        112 BB(15)=ND(6)*1000+I*10                                  BFCNT540
 212            BB(1)=10.*(BB(15)+BB(12))+BB(14)                        BFCNT550
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CARD NO  ****                    CONTENTS                    ****
               BD(2)=BD(15)                                  BFCNT560
         C     MACH NUMBER CHANGE TEST.                      BFCNT562
               IF(BD(10)-BD(16))117,180,117                  BFCNT564
         C     ALTITUDE CHANGE TEST.                         BFCNT566
           180 IF(BD(9)-BD(11))129,110,129                   BFCNT568
           117 BD(16)=BD(10)                                 BFCNT570
           129 BD(11)=BD(9)                                  BFCNT572
               NF=-1                                         BFCNT574
               CALL UBPAF                                    BFCNT576
               IF(ICALCS.EQ.0) GO TO 110                     BFCNT578
               DO 90 J=1,NEQ                                 BFCNT580
               BU(48+J)=BF(85+J)                             BFCNT582
            90 BU(57+J)=BF(98+J)                             BFCNT584
               BU(65)=BD(12)                                 BFCNT586
           110 CONTINUE                                      BFCNT588
               GO TO (121,122,123,119,119,124,125,119,119,124,125,119,119,124,125BFCNT590
              1,119,119,121,122,119,119,119,119),I           BFCNT592
           119 NI=1                                          BFCNT594
               GO TO 126                                     BFCNT596
           121 NI=2                                          BFCNT600
               GO TO 126                                     BFCNT602
           122 NI=3                                          BFCNT604
               GO TO 126                                     BFCNT606
           123 NI=4                                          BFCNT608
               GO TO 126                                     BFCNT610
           124 NI=5                                          BFCNT612
               GO TO 126                                     BFCNT614
           125 NI=6                                          BFCNT616
           126 CALL BULDBF                                   BFCNT618
               CALL SPABNT                                   BFCNT620
               IF(ND(40))96,96,40                            BFCNT625
            40 IC=1                                          BFCNT630
               IDC=I*10000000+NC*100000+I*1000+1             BFCNT635
               DO 51 J=1,100,5                               BFCNT640
               WRITE(14,50)IC,BD(J),BD(J+1),BD(J+2),BD(J+3),BD(J+4),IDC   BFCNT645
            50 FORMAT(I12,1P5E12.5,I8)                       BFCNT650
               IC=IC+5                                       BFCNT655
            51 IDC=IDC+1                                     BFCNT660
            96 IF(ND(41))127,127,52                          BFCNT665
            52 WRITE(6,53)                                   BFCNT670
            53 FORMAT(1H1)                                   BFCNT675
               IC=1                                          BFCNT678
               IDC=I*10000000+NC*100000+I*1000+1             BFCNT679
               DO 95 J=1,100,5                               BFCNT680
               WRITE(6,94)IC,BD(J),BD(J+1),BD(J+2),BD(J+3),BD(J+4),IDC    BFCNT685
            94 FORMAT(1H 5X,I12,3X,1P5E15.5,3X,I8)           BFCNT690
               IC=IC+5                                       BFCNT695
            95 IDC=IDC+1                                     BFCNT700
               WRITE(6,53)                                   BFCNT705
           127 CONTINUE                                      BFCNT710
               GO TO 3                                       BFCNT800
               END                                           BFCNT900
               SUBROUTINE RERDAT                             RERDA001
         C     REARRANGES BC AND NEW BF DATA TO BFCNTL FORMAT.   RERDA005
         C     SETS UP EI AND GJ DATA FOR WFLEX INPUT.       RERDA007
               COMMON TCOM(4400)                             RERDA010
               DIMENSION BC(195),BF(200),ND(200)             RERDA015
               EQUIVALENCE (BC(1),TCOM(2750)),(BF(1),TCOM(4001)),(ND(1),TCOM(420RERDA020
              11)),(I,ND(132)),(J,ND(133)),(IR,ND(107)),(IP,ND(137))   RERDA025
               IF(IR)1,1,20                                  RERDA027
             1 CALL DECRD (BC)                               RERDA030
               CALL RECRD (BF)                               RERDA032
               WRITE(6,33)                                   RERDA034
               WRITE(6,34) (BC(I),I=1,100)                   RERDA036
               WRITE(6,33)                                   RERDA038
               WRITE(6,34) (BF(I),I=1,100)                   RERDA040
               DO 2 I=111,113                                RERDA043
             2 BF(I)=BC(I+95)                                RERDA046
               DO 3 I=107,110                                RERDA050
             3 BF(I)=BC(I-7)                                 RERDA055
               DO 4 I=172,191                                RERDA060
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CARD NO **** CONTENTS ****

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      J=383-1                                              RERDA063
    4 BC(J)=BC(J-3)                                        RERDA066
      BC(160)=BC(157)                                      RERDA070
      DO 5 I=161,171                                       RERDA075
    5 BC(I)=BC(I-15)                                       RERDA080
      BC(150)=BC(104)                                      RERDA085
      DO 6 I=150,158                                       RERDA090
    6 BC(I)=BC(I-13)                                       RERDA095
      BC(138)=BC(125)                                      RERDA100
      DO 7 I=138,149                                       RERDA105
    7 BC(I)=BC(I-25)                                       RERDA110
      DO 8 I=128,137                                       RERDA115
    8 BC(I)=BC(I-24)                                       RERDA120
      IF(ND(14))9,9,11                                     RERDA125
    9 DO 10 I=87,128                                       RERDA130
   10 BC(I)=0.0                                            RERDA135
      GO TO 15                                             RERDA140
   11 DO 12 I=109,128                                      RERDA145
   12 BC(I)=BF(I-82)                                       RERDA150
      BC(87)=BC(88)                                        RERDA155
      DO 13 I=88,108                                       RERDA160
   13 BC(I)=BC(I-21)                                       RERDA165
      DO 14 I=82,86                                        RERDA170
   14 BC(I)=BC(I-20)                                       RERDA175
      BC(81)=BF(26)                                        RERDA180
      BC(80)=BC(71)                                        RERDA185
      BC(88)=BC(70)                                        RERDA190
      BC(88)=BF(25)                                        RERDA195
      BC(87)=BC(68)                                        RERDA200
   15 DO 16 I=67,86                                        RERDA205
   16 BC(I)=BF(I-62)                                       RERDA210
      DO 17 I=58,66                                        RERDA212
      J=124-I                                              RERDA214
   17 BC(J)=BC(J-10)                                       RERDA216
      BC(95)=BC(57)                                        RERDA218
      BC(57)=BC(47)                                        RERDA220
      BC(56)=BC(46)                                        RERDA225
      DO 18 I=50,54                                        RERDA230
   18 BC(I)=BC(I-8)                                        RERDA235
      BC(49)=BF(4)                                         RERDA240
      BC(48)=BC(40)                                        RERDA245
      BC(47)=BC(39)                                        RERDA250
      BC(46)=BF(3)                                         RERDA255
      BC(45)=BC(38)                                        RERDA260
      DO 19 I=41,44                                        RERDA265
   19 BC(I)=BF(I+66)                                       RERDA270
      DO 20 I=34,40                                        RERDA275
      J=74-I                                               RERDA278
   20 BC(J)=BC(J-3)                                        RERDA280
      IF(ND(14))21,21,23                                   RERDA285
   21 DO 22 I=29,33                                        RERDA290
   22 BC(I)=0.0                                            RERDA295
      GO TO 24                                             RERDA300
   23 BC(33)=BF(2)                                         RERDA305
      BC(32)=BF(29)                                        RERDA310
      BC(31)=BC(28)                                        RERDA315
      BC(30)=BC(26)                                        RERDA320
      BC(29)=BC(25)                                        RERDA325
   24 BC(28)=BF(1)                                         RERDA330
      DO 25 I=25,27                                        RERDA335
   25 BC(I)=BF(I+86)                                       RERDA340
      RETURN                                               RERDA345
   26 IF(IP)28,27,28                                       RERDA355
   27 BF(117)=BC(40)/COS(BC(80)/57.3)                      RERDA360
      BF(174)=BC(96)*6.0/COS(BC(80)/57.3)                  RERDA365
      GO TO 29                                             RERDA370
   28 BF(117)=BC(40)/COS(BC(46)/57.3)                      RERDA375
      BF(174)=BC(54)*6.0/COS(BC(46)/57.3)                  RERDA380
   29 BF(114)=0.0                                          RERDA385
      BF(115)=.25*BF(117)                                  RERDA390
      BF(116)=.50*BF(117)                                  RERDA395
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CARD NO **** CONTENTS ****

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      BF(110)=1.1*BF(117)                                        RERDA400
      BF(137)=CODINE(BF(117),BF(47),BF(67),ND(42),.5)            RERDA405
      BF(157)=CODINE(BF(117),BF(47),BF(87),ND(42),.5)            RERDA410
      DO 30 I=134,136                                            RERDA415
      BF(I)=10.*BF(137)                                          RERDA420
   30 BF(I+20)=10.*BF(157)                                       RERDA425
      BF(175)=(BF(174)-BF(110))/15.0                             RERDA430
      DO 31 I=119,133                                            RERDA435
   31 BF(I)=BF(I-1)+BF(175)                                      RERDA440
      DO 32 I=138,153                                            RERDA445
      BF(I)=CODINE(BF(I-20),BF(47),BF(67),ND(42),.5)             RERDA450
   32 BF(I+20)=CODINE(BF(I-20),BF(47),BF(87),ND(42),.5)          RERDA455
      RETURN                                                     RERDA500
   33 FORMAT(1H1)                                                RERDA505
   34 FORMAT(1H SKIPSE15.5)                                      RERDA510
      END                                                        RERDA600
      SUBROUTINE SECRD(V)
      DIMENSION V(1),T(5),A(10)
      DATA BLANK/8H        /
    5 READ(5,1)ND,(T(N),N=1,5),(A(N),N=1,10)
    1 FORMAT(T1,I12,T13,5F12.0,T13,10A8)
      IF(EOF(5))21,22
   21 CALL EXIT
C
   22 IF(ND)7,8,7
C
    8 WRITE(6,9)    (A(N),N=1,10)
    9 FORMAT(/17H NO DECK LOCATION,5X,10A8/)
      GO TO 5
C
    7 DO 2 N=1,5
      NN = 2*N - 1
      IF(A(NN) - BLANK)3,11,3
   11 IF(A(NN+1) - BLANK)3,2,3
    3 III = IABS(ND) + N - 1
      V(III) = T(N)
    2 CONTINUE
      IF(ND)6,5,5
    6 RETURN
      END
      SUBROUTINE USPAF                                                  USPF0001
C     STAND ALONE FLEXIBILITY SUBROUTINE FOR SWEEP II.                  USPF0002
C     DERIVES FLEXIBLE WING AND RIGID EMPENNAGE FACTORS AND UNIT AIRLOADUSPF0003
C     DISTRIBUTIONS. FLEXIBILITY INCLUDES ANGLE OF ATTACK, DEFLECTED    USPF0004
C     FLAP, AND AEROELASTIC INERTIA EFFECTS.                            USPF0005
      COMMON TCOM(4400)                                                 USPF0010
      DIMENSION ND(200),DT(95),DB(853),DF(146),DP(734),BC(195),BB(20),SSUSPF0020
     1(20),BD(160),BU(500),BO(340),YA(4),YB(10),YC(5),CD(5),ESS(13),YSS(USPF0021
     213),DPA(11),DPF(11),AFW(10,3),AFWCP(10,3),AFWF(10,3),AFWDF(10,3),FUSPF0022
     3(3,4),YE1GJ(20),EI(20),GJ(20),ECP(11),ULN(11),DXS(13),UTN(11),BF(2USPF0023
     400)                                                               USPF0024
      EQUIVALENCE (DT(1),TCOM(100)),(DB(1),TCOM(195)),(DF(1),TCOM(1000))USPF0030
     1,(DP(1),TCOM(1195)),(ND(1),TCOM(4201)),(BC(1),TCOM(2758)),(BB(1),TUSPF0031
     2COM(2953)),(BS(1),TCOM(2973)),(BD(1),TCOM(2993)),(BU(1),TCOM(3153)USPF0032
     3),(BO(1),TCOM(3653)),(BF(1),TCOM(4001)),(AFW(1,1),BU(206)),(AFWCP(USPF0033
     41,1),BU(236)),(AFWF(1,1),BU(266)),(AFWDF(1,1),BU(316)),(F(1,1),BU(USPF0034
     5346.)),(YE1GJ(1),BF(114)),(EI(1),BF(134)),(GJ(1),BF(154)),(CMN,BD(1USPF0035
     60)),(VT,BD(141)),(YA(1),BD(1)),(YB(1),BD(5)),(YC(1),BD(21)),(CD(1),USPF0036
     7BD(26)),(ESS(1),BD(31)),(YSS(1),BD(45)),(DPA(1),BD(58)),(DPF(1),BDUSPF0037
     8(70)),(ECP(1),BD(95)),(ULN(1),BD(106)),(DXS(1),BD(117)),(UTN(1),BDUSPF0038
     9(130)),(NB,ND(43)),(ICALCS,ND(105)),(NOE1GJ,ND(103)),(IR,ND(107)) USPF0039
      EQUIVALENCE (NF,ND(100)),(I,ND(132)),(J,ND(133)),(K,ND(134)),(L,NDUSPF0040
     1(135)),(M,ND(136)),(IP,ND(137)),(NT,ND(149))                      USPF0041
      DO 1 I=1,500                                                      USPF0050
    1 BU(I)=0.0                                                         USPF0055
      NT=1                                                              USPF0060
      IF(CMN-1.0)2,6,6                                                  USPF0065
    2 IF(CMN-.95)4,4,3                                                  USPF0070
    3 BS(2)=.95                                                         USPF0075
      GO TO 5                                                           USPF0080
    4 BS(2)=CMN                                                         USPF0085
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CARD NO   ****                      CONTENTS                             ****
  426     C     SUBSONIC B/K PARAMETER.                                  UBPF0090
  427         5 BS(1)=CODINP(BS(2),DT(9),DT(21),12,.5)                   UBPF0095
  428           GO TO 9                                                  UBPF0100
  429         6 IF(CMN-1.1)7,8,8                                         UBPF0105
  430         7 BS(2)=1.1                                                UBPF0110
  431           GO TO 9                                                  UBPF0115
  432         8 BS(2)=CMN                                                UBPF0120
  433         9 IF(NT-5)10,10,18                                         UBPF0125
  434     C     WING ANALYSIS.                                           UBPF0130
  435        10 BS(3)=CODINP(CMN,DT(9),DT(33),12,.5)                     UBPF0135
  436           BS(4)=BC(40)                                             UBPF0140
  437           IP=BD(12)-2.0                                            UBPF0145
  438           IF(IP)14,11,14                                           UBPF0150
  439     C     WING VARIABLE SWEEP FWD.                                 UBPF0155
  440        11 DO 12 I=5,13                                             UBPF0160
  441        12 BS(I)=BC(I+82)                                           UBPF0165
  442           BS(14)=BC(96)*6.0                                        UBPF0170
  443           BS(16)=BC(97)                                            UBPF0175
  444           DO 13 I=1,11                                             UBPF0180
  445        13 BU(I+9)=BC(109-I)/BS(14)                                 UBPF0185
  446           GO TO 17                                                 UBPF0190
  447     C     WING FIXED OR VARIABLE SWEEP AFT.                        UBPF0195
  448        14 DO 15 I=5,13                                             UBPF0200
  449        15 BS(I)=BC(I+40)                                           UBPF0205
  450           BS(14)=BC(54)*6.0                                        UBPF0210
  451           BS(16)=BC(55)                                            UBPF0215
  452           DO 16 I=1,11                                             UBPF0220
  453        16 BU(I+9)=BC(67-I)/BS(14)                                  UBPF0225
  454        17 BU(9)=1.0                                                UBPF0230
  455           BS(15)=BS(4)/BS(14)                                      UBPF0235
  456           BS(17)=BC(42)/BS(14)                                     UBPF0240
  457           BS(18)=BC(41)/BS(14)                                     UBPF0245
  458           GO TO 25                                                 UBPF0250
  459     C     EXPOSURE (X/C) OF CP.                                    UBPF0255
  460        18 BS(3)=CODINP(CMN,DT(9),DT(45),12,.5)                     UBPF0260
  461           IF(NT-6)19,22,22                                         UBPF0265
  462     C     HORIZONTAL TAIL PARAMETERS.                              UBPF0270
  463        19 BS(4)=BC(137)                                            UBPF0275
  464           BS(5)=BC(129)                                            UBPF0280
  465           BS(7)=BC(130)                                            UBPF0285
  466           BS(8)=BC(131)                                            UBPF0290
  467           DO 20 I=10,13                                            UBPF0295
  468        20 BS(I)=BC(I+122)                                          UBPF0300
  469           BS(14)=BC(136)*6.0                                       UBPF0305
  470           BS(15)=BS(4)/BS(14)                                      UBPF0310
  471           BS(16)=BC(138)                                           UBPF0315
  472           DO 21 I=1,11                                             UBPF0320
  473        21 BU(I+115)=BC(150-I)/BS(14)                               UBPF0325
  474           BU(115)=1.0                                              UBPF0330
  475           GO TO 25                                                 UBPF0335
  476     C     VERTICAL TAIL PARAMETERS.                                UBPF0340
  477        22 BS(4)=BC(158)                                            UBPF0345
  478           BS(5)=BC(150)                                            UBPF0350
  479           BS(7)=BC(151)                                            UBPF0355
  480           BS(8)=BC(152)                                            UBPF0360
  481           DO 23 I=10,13                                            UBPF0365
  482        23 BS(I)=BC(I+143)                                          UBPF0370
  483           BS(14)=BC(157)*12.0                                      UBPF0375
  484           BS(15)=BS(4)/BS(14)                                      UBPF0380
  485           BS(16)=BC(160)                                           UBPF0385
  486           DO 24 I=1,11                                             UBPF0390
  487        24 BU(I+174)=BC(172-I)/BS(14)                               UBPF0395
  488           BU(174)=1.0                                              UBPF0400
  489           BS(12)=BS(12)*2.0                                        UBPF0405
  490        25 IF(CMN-1.0)26,30,30                                      UBPF0410
  491     C     SUBSONIC AERO DATA.                                      UBPF0415
  492        26 BS(19)=ATAN((TAN(BS(9)/57.3)-(1.0-BS(11))/(BS(12)*(1.0+BS(11))))/SUBPF0420
  493          1QRT(1.0-BS(2)**2))*57.3                                  UBPF0425
  494           BS(20)=BS(1)*BS(12)                                      UBPF0430
  495     C     SUBSONIC BCLA/K TABLE VALUES.                            UBPF0435
  496           L=0                                                      UBPF0440
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CARD NO  ****                          CONTENTS                           ****
  497            DO 27 I=1,4                                              UBPF0445
  498            K=I+L+005                                                UBPF0450
  499            YA(I)=FCODM2(BS(19),BS(20),DB(1),DB(7),DB(K),7,6,.5)      UBPF0455
  500         27 L=L+1                                                    UBPF0460
  501            WRITE(6,28)BS(12),BS(19),BS(11),BS(20)                   UBPF0465
  502            WRITE(6,29)(DT(I),I=5,8),(YA(I),I=1,4)                   UBPF0480
  503            IF(NT-5)30,32,34                                         UBPF0490
  504       C    WING RIGID CLA.                                          UBPF0495
  505         30 BD(10)=CODIM2(BS(11),DT(5),YA,4,.5)*57.3/BS(1)           UBPF0500
  506            WRITE(6,31)                                              UBPF0505
  507            GO TO 37                                                 UBPF0515
  508         32 I=100                                                    UBPF0520
  509            WRITE(6,33)                                              UBPF0525
  510            GO TO 36                                                 UBPF0535
  511         34 I=107                                                    UBPF0540
  512            WRITE(6,35)                                              UBPF0545
  513       C    EMPENNAGE LIFT CURVE SLOPE.                              UBPF0555
  514         36 BU(I)=CODIM2(BS(11),DT(5),YA,4,.5)*57.3/BS(1)            UBPF0560
  515       C    SUBSONIC (CLC/CLCAV) TABLE VALUES.                       UBPF0565
  516         37 L=0                                                      UBPF0570
  517            DO 38 I=1,16                                             UBPF0575
  518            K=I+L+13                                                 UBPF0580
  519            YB(I)=FCODM2(BS(19),BS(20),DB(1),DB(7),DB(K),7,6,.5)      UBPF0585
  520         38 L=L+1                                                    UBPF0590
  521            GO TO 46                                                 UBPF0595
  522       C    SUPERSONIC AERO DATA.                                    UBPF0600
  523         39 BS(19)=BS(12)*SQRT(BS(2)**2-1.0)                         UBPF0605
  524            BS(20)=SQRT(BS(2)**2-1.0)/TAN(BS(5)/57.3)                UBPF0610
  525       C    SUPERSONIC (2T/VAB) TABLE VALUES.                        UBPF0615
  526            L=0                                                      UBPF0620
  527            DO 40 I=1,16                                             UBPF0625
  528            K=I+L+14                                                 UBPF0630
  529            YB(I)=FCODM2(BS(20),BS(19),DP(6),DP(1),DP(K),5,6,.5)      UBPF0635
  530         40 L=L+4                                                    UBPF0640
  531            WRITE(6,41)BS(12),BS(11),BS(19),BS(20)                   UBPF0645
  532            WRITE(6,42)(DT(I),I=5,8)                                 UBPF0655
  533            IF(NT-5)43,44,45                                         UBPF0665
  534         43 WRITE(6,31)                                              UBPF0670
  535            GO TO 46                                                 UBPF0675
  536         44 WRITE(6,33)                                              UBPF0680
  537            GO TO 46                                                 UBPF0685
  538         45 WRITE(6,35)                                              UBPF0690
  539         46 WRITE(6,47)CMN                                           UBPF0695
  540            J=1                                                      UBPF0705
  541            K=4                                                      UBPF0710
  542            L=1                                                      UBPF0715
  543         48 WRITE(6,49)(YB(I),I=J,K),DT(L)                           UBPF0720
  544            J=J+4                                                    UBPF0730
  545            K=K+4                                                    UBPF0735
  546            L=L+1                                                    UBPF0740
  547            IF(L-4)48,48,50                                          UBPF0745
  548       C    LOADING AT AERO DATA STATIONS.                           UBPF0750
  549         50 DO 51 I=1,4                                              UBPF0755
  550            L=(I-1)*4+1                                              UBPF0760
  551         51 YC(I)=CODIM2(BS(11),DT(5),YB(L),4,.5)                    UBPF0765
  552            YC(5)=0.0                                                UBPF0770
  553            IF(NT-6)52,52,54                                         UBPF0775
  554         52 L=5                                                      UBPF0780
  555            DO 53 I=1,4                                              UBPF0785
  556         53 ED(I)=DT(I)                                              UBPF0790
  557            ED(5)=1.0                                                UBPF0795
  558            GO TO 55                                                 UBPF0800
  559         54 L=3                                                      UBPF0805
  560            ED(1)=0.0                                                UBPF0810
  561            ED(2)=.942                                               UBPF0815
  562            ED(3)=1.0                                                UBPF0820
  563         55 WRITE(6,56)CMN                                           UBPF0825
  564            WRITE(6,57)(ED(I),YC(I),I=1,L)                           UBPF0835
  565            IF(NT-6)58,120,120                                       UBPF0845
  566       C    WING STRIP BOUNDARY STATIONS.                            UBPF0850
  567         58 ESS(1)=1.0                                               UBPF0855
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CARD NO **** CONTENTS ****

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      ESS(ND+1)=BS(15)                                        UBPF0860
      ESS(ND+2)=0.0                                           UBPF0865
      BD(44)=BD(43)                                           UBPF0870
      DO 50 I=2,ND                                            UBPF0875
   50 ESS(I)=ESS(I-1)+(1.0-ESS(ND+1))/BD(44)                  UBPF0880
C     STRIP LOADING DUE TO RIGID ALPHA EFFECTS.               UBPF0885
      J=ND+2                                                  UBPF0890
      DO 60 I=1,J                                             UBPF0895
   60 YSS(I)=CODIM2(ESS(I),CD,YC,L,.5)                        UBPF0900
C     STRIP NET RIGID UNIT ALPHA EFFECTS LOAD.                UBPF0905
      BD(90)=0.0                                              UBPF0910
      DO 61 I=2,J                                             UBPF0915
      DPA(I-1)=.5*(ESS(I-1)-ESS(I))*(YSS(I-1)+YSS(I))         UBPF0920
   61 BD(90)=BD(90)+DPA(I-1)                                  UBPF0925
C     MODIFY CARRYOVER STRIP LOAD AND NORMALIZE.              UBPF0930
      BD(90)=BD(90)-.5*DPA(ND+1)                              UBPF0935
      DPA(ND+1)=.5*DPA(ND+1)                                  UBPF0940
      DO 62 I=2,J                                             UBPF0945
   62 DPA(I-1)=DPA(I-1)/BD(90)                                UBPF0950
      IF(CMN-1.0)64,63,63                                     UBPF0955
C     SUPERSONIC CLAD RIGID.                                  UBPF0960
   63 BD(10)=BS(12)*BD(90)                                    UBPF0965
C     MODIFY CLA RIGID.                                       UBPF0970
   64 BD(10)=BD(10)*BD(90)/BD(80)                             UBPF0975
C     FIRST COLUMNS IN AFM AND AFMCP MATRICES.                UBPF0980
      DO 65 I=1,ND                                            UBPF0985
      K=ND+1-I                                                UBPF0987
      AFM(I,1)=DPA(K)                                         UBPF0990
   65 AFMCP(I,1)=BS(3)                                        UBPF0995
C     RIGID STRIP LOADING DUE TO FLAP DEFLECTION.             UBPF1000
      WRITE(6,88)CMN,BD(5)                                    UBPF1005
      DO 66 I=1,J                                             UBPF1020
      YSS(I)=FCODM2(ESS(I),BS(17),DF(26),DF(18),DF(37),18,11,.5) UBPF1025
      YB(I)=FCODM2(ESS(I),BS(18),DF(26),DF(18),DF(37),18,11,.5)  UBPF1030
      WRITE(6,87)ESS(I),YSS(I),YB(I)                          UBPF1035
C     NET RIGID FLAP DEFLECTION INCREMENT.                    UBPF1045
      YSS(I)=YSS(I)-YB(I)                                     UBPF1050
   66 WRITE(6,88)YSS(I)                                       UBPF1055
C     COMPUTE NSF AND NORMALIZED STRIP LOADS.                 UBPF1065
      BU(6)=0.0                                               UBPF1070
      DO 70 I=2,J                                             UBPF1075
      DPF(I-1)=.5*(ESS(I-1)-ESS(I))*(YSS(I-1)+YSS(I))         UBPF1080
   70 BU(6)=BU(6)+DPF(I-1)                                    UBPF1085
      DO 71 I=2,J                                             UBPF1090
   71 DPF(I-1)=DPF(I-1)/BU(6)                                 UBPF1095
C     SECOND COLUMNS IN AFM AND AFMCP MATRICES.               UBPF1100
      BD(88)=CODIM2(BC(43),DF(1),DF(6),5,.5)                  UBPF1105
      DO 72 I=1,ND                                            UBPF1110
      K=ND+1-I                                                UBPF1113
      AFM(I,2)=DPF(K)                                         UBPF1115
   72 AFMCP(I,2)=BD(88)                                       UBPF1120
C     THIRD COLUMNS IN AFM AND AFMCP MATRICES.                UBPF1125
      IF(IP)74,73,74                                          UBPF1130
   73 J=100                                                   UBPF1135
      GO TO 75                                                UBPF1140
   74 J=66                                                    UBPF1145
   75 BD(91)=0.0                                              UBPF1146
      DO 100 I=1,ND                                           UBPF1147
      K=I+J                                                   UBPF1148
  100 BD(91)=BD(91)+BC(K)                                     UBPF1149
      DO 76 I=1,ND                                            UBPF1150
      K=I+J                                                   UBPF1155
      M=K+10                                                  UBPF1160
      AFM(I,3)=-BC(K)/BD(91)                                  UBPF1165
   76 AFMCP(I,3)=BC(M)                                        UBPF1170
C     COMPUTE DYNAMIC PRESSURE, PERCENT OF EXPOSED LOAD, AND CALL WFLEX.UBPF1175
      CALL ATMOS (BD(9),BD(92),BD(93),BD(94))                 UBPF1180
      BD(17)=.5*BD(92)*(BD(94)**2)*(BD(10)**2)                UBPF1182
      BD(18)=SQRT(295.*BD(17))                                UBPF1184
      BD(91)=1.0                                              UBPF1186
      IF(ND(14))110,110,100                                   UBPF1188
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CARD NO   ****                        CONTENTS                                  ****

639       100 IF(BD(12)-BU(495))102,110,102                                  UBFT1190
640       110 DO 112 I=1,40                                                  UBFT1192
641           IF(BF(86+I)-BU(494+I))102,112,102                              UBFT1194
642       112 CONTINUE                                                       UBFT1196
643           ICALCS=0                                                       UBFT1198
644           GO TO 103                                                      UBFT1200
645       102 ICALCS=1                                                       UBFT1202
646       103 NOEIGJ=20                                                      UBFT1204
647           IR=1                                                           UBFT1206
648           CALL RERDAT                                                    UBFT1208
649           CALL WFLEX (AFH,AFHCP,AFHF,AFHDF,F,VEIGJ,EI,GJ,BS(10),BS(14),BS(4)UBFT1210
650          1,BS(5),BS(8),BS(6),BS(9),BS(11),BD(17),BD(18),BD(91),BS(13),NOEIGJ,UBFT1211
651          2,ND(43),ICALCS,ND(44),ND(45))                                  UBFT1212
652     C     COMPUTE STRIP CP STATIONS AND FLEXIBLE CLA.                    UBFT1214
653           BD(89)=0.0                                                     UBFT1216
654           BD(90)=0.0                                                     UBFT1220
655           ECP(NB+1)=.5*BS(15)                                            UBFT1225
656           DO 77 I=1,NB                                                   UBFT1230
657           BD(93)=NB-I                                                    UBFT1235
658           ECP(I)=BS(15)+.5*(1.0-BS(15))/BD(44)+BD(93)*(1.0-BS(15))/BD(44)  UBFT1240
659           BD(89)=BD(89)+AFH(I,1)                                         UBFT1245
660        77 BD(90)=BD(90)+AFHF(I,1)                                        UBFT1250
661           BU(1)=BD(18)*(DPA(NB+1)+BD(90))/(DPA(NB+1)+BD(89))             UBFT1255
662     C     COMPUTE RUNNING NORMAL LOAD.                                   UBFT1260
663     C     NT=1 (FLEXIBLE ALPHA EFFECT).                                  UBFT1265
664     C     NT=2 (RIGID FLAP EFFECT).                                      UBFT1270
665     C     NT=3 (FLAP AEROELASTIC INCREMENT).                             UBFT1275
666     C     NT=4 (INERTIA AEROELASTIC INCREMENT).                          UBFT1280
667        78 GO TO (79,81,83,85),NT                                         UBFT1285
668        79 K=1                                                            UBFT1290
669           ULN(NB+1)=DPA(NB+1)/BS(15)                                     UBFT1295
670           DO 80 I=1,NB                                                   UBFT1300
671           J=NB+1-I                                                       UBFT1303
672        80 ULN(I)=AFHF(J,1)*BD(44)/(1.0-BS(15))                           UBFT1305
673           GO TO 88                                                       UBFT1310
674        81 K=2                                                            UBFT1315
675           ULN(NB+1)=DPF(NB+1)/BS(15)                                     UBFT1320
676           DO 82 I=1,NB                                                   UBFT1325
677           J=NB+1-I                                                       UBFT1327
678        82 ULN(I)=AFH(J,2)*BD(44)/(1.0-BS(15))                            UBFT1330
679           GO TO 88                                                       UBFT1335
680        83 DO 84 I=1,NB                                                   UBFT1340
681           J=NB+1-I                                                       UBFT1343
682        84 ULN(I)=AFHDF(J,2)*BD(44)/(1.0-BS(15))                          UBFG1345
683           GO TO 87                                                       UBFT1350
684        85 DO 86 I=1,NB                                                   UBFT1355
685           J=NB+1-I                                                       UBFT1357
686        86 ULN(I)=AFHDF(J,3)*BD(44)/(1.0-BS(15))                          UBFT1360
687        87 K=1                                                            UBFT1365
688           ULN(NB+1)=0.0                                                  UBFT1370
689     C     COMPUTE SWEPT TORSION ARMS AND TORSIONAL LOADING.              UBFT1375
690        88 BD(141)=4.0*(1.0-BS(11))*SIN(BS(7)/57.3)*COS(BS(7)/57.3)/(BS(12)*(UBFT1380
691          1(1.0+BS(11)))                                                  UBFT1381
692           BD(142)=BS(16)*(1.0-BD(141)*(1.0-BS(16)))                      UBFT1385
693           BD(145)=1.0-BD(141)*(1.0-BS(16)-BD(142))                       UBFT1390
694           DO 89 I=1,NB                                                   UBFT1395
695           J=NB+1-I                                                       UBFT1397
696           BD(143)=AFHCP(J,K)*(1.0-BD(141)*(1.0-AFHCP(J,K)))              UBFT1400
697           BD(144)=(1.0-ECP(I)*(1.0-BS(11)))*BS(10)*COS(BS(7)/57.3)/BD(145)  UBFT1405
698           DXS(I)=BD(144)*(BD(143)-BD(142))                               UBFT1415
699        89 UTN(I)=-ULN(I)*DXS(I)                                          UBFT1420
700           DXS(NB+1)=DXS(NB)+(ECP(NB)-ECP(NB+1))*BS(14)*SIN(BS(7)/57.3)   UBFT1425
701           UTN(NB+1)=-ULN(NB+1)*DXS(NB+1)                                 UBFT1430
702     C     DETERMINE LOADINGS AT HT ANALYSIS STATIONS.                    UBFT1435
703           YB(1)=0.0                                                      UBFT1440
704           YSS(1)=0.0                                                     UBFT1445
705           J=NB+1                                                         UBFT1447
706           DO 92 I=2,13                                                   UBFT1450
707           IF(BU(I+8)-BS(15))91,90,90                                     UBFT1455
708        90 YB(I)=CODIM2(BU(I+8),ECP,ULN,J,.5)                             UBFT1460
709           YSS(I)=CODIM2(BU(I+8),ECP,UTN,J,.5)                            UBFT1465
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CARD NO   ****   CONTENTS   ****

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         GO TO 92                                                         UBFF1470
      91 YB(I)=ULN(NB+I)                                                  UBFF1475
         YBS(I)=UTN(NB+I)                                                 UBFF1480
      92 CONTINUE                                                         UBFF1485
         WRITE(6,93)                                                      UBFF1490
         GO TO (94,95,98,100),NT                                          UBFF1500
      94 WRITE(6,95)                                                      UBFF1505
         GO TO 102                                                        UBFF1515
      95 WRITE(6,97)                                                      UBFF1520
         GO TO 102                                                        UBFF1530
      98 WRITE(6,99)                                                      UBFF1535
         GO TO 102                                                        UBFF1545
     100 WRITE(6,101)                                                     UBFF1550
     102 WRITE(6,97)(BU(I+8),YB(I),I=1,13)                                UBFF1560
         WRITE(6,103)                                                     UBFF1565
         WRITE(6,104)(BU(I+8),YBS(I),I=1,13)                              UBFF1575
C        COMPUTE NORMALIZING FACTOR KUZ=BD(147).                          UBFF1580
         GO TO (105,107,109,111),NT                                       UBFF1585
     105 K=22                                                             UBFF1600
         GO TO 113                                                        UBFF1620
     107 K=88                                                             UBFF1625
         GO TO 113                                                        UBFF1645
     109 K=305                                                            UBFF1650
         GO TO 113                                                        UBFF1665
     111 K=411                                                            UBFF1670
     113 BD(148)=0.0                                                      UBFF1685
         DO 114 I=2,13                                                    UBFF1690
     114 BD(148)=BD(148)+.5*(BU(I+7)-BU(I+8))*(YB(I-1)+YB(I))             UBFF1695
         BD(147)=1.0/BD(148)                                              UBFF1700
C        UNIT SPANWISE SHEAR, MOMENT, AND TORQUE.                         UBFF1705
         BU(K)=0.0                                                        UBFF1710
         BU(K+13)=0.0                                                     UBFF1715
         BU(K+26)=0.0                                                     UBFF1720
         DO 115 I=2,13                                                    UBFF1725
         M=I+K-1                                                          UBFF1730
         BU(M)=BU(M-1)+.5*BD(147)*(BU(I+7)-BU(I+8))*(YB(I-1)+YB(I))       UBFF1735
         BU(M+13)=BU(M+12)+.5*BS(14)*(BU(I+7)-BU(I+8))*(BU(M-1)+BU(M))/COSUBFF1740
        1(BS(7)/57.3)                                                     UBFF1745
     115 BU(M+26)=BU(M+25)+.5*BD(147)*(BU(I+7)-BU(I+8))*(YBS(I-1)+YBS(I)) UBFF1750
         IF(NT-2)116,117,117                                              UBFF1755
     116 M=K-16                                                           UBFF1760
         GO TO 118                                                        UBFF1765
     117 M=K-3                                                            UBFF1770
C        SHEAR, MOMENT, AND TORQUE AT BODY SIDE.                          UBFF1775
     118 BU(M)=CODIN2(BS(15),BU(10),BU(K+1),12,.5)                        UBFF1780
         BD(148)=CODIN2(BS(15),BU(10),BU(K+14),12,.5)                     UBFF1785
         BD(149)=CODIN2(BS(15),BU(10),BU(K+27),12,.5)                     UBFF1790
         BU(M+1)=BD(148)*COS(BS(7)/57.3)+BD(149)*SIN(BS(7)/57.3)          UBFF1795
         BU(M+2)=BD(149)*COS(BS(7)/57.3)-BD(148)*SIN(BS(7)/57.3)          UBFF1800
C        CHORDWISE CP OF TOTAL LOAD.                                      UBFF1805
         BU(M-4)=BS(10)*BS(16)-(BU(K+38)*COS(BS(7)/57.3)-BU(K+25)*SIN(BS(7UBFF1810
        1/57.3))/BU(K+12)                                                 UBFF1815
C        EXPOSED LOAD YCP AND XCP.                                        UBFF1820
         BU(M-3)=BS(4)+BU(M+1)/BU(M)                                      UBFF1825
         BU(M-2)=BS(10)*BS(16)+BS(4)*TAN(BS(7)/57.3)-BU(M+2)/BU(M)        UBFF1830
C        CHORDWISE CP OF CARRYOVER LOAD.                                  UBFF1835
         BU(M-1)=BS(10)*BS(16)-((BU(K+38)-BD(149))*COS(BS(7)/57.3)-(BU(K+25UBFF1840
        1)-BD(148)-BS(4)*BU(M)/COS(BS(7)/57.3))*SIN(BS(7)/57.3))/(BU(M+12)-UBFF1845
        2BU(M))                                                           UBFF1850
         NT=NT+1                                                          UBFF1855
         IF(NT-4)78,78,119                                                UBFF1860
     119 IF(NF)0,0,160                                                    UBFF1865
C        EMPENNAGE DISTRIBUTIONS ENTRY.                                   UBFF1870
     120 DO 124 I=1,13                                                    UBFF1875
         IF(NT-6)121,122,122                                              UBFF1880
C        HOR TAIL STATIONS.                                               UBFF1885
     121 K=I+114                                                          UBFF1890
         GO TO 123                                                        UBFF1895
C        VERT TAIL STATIONS.                                              UBFF1900
     122 K=I+173                                                          UBFF1905
     123 C95(I)=BU(K)                                                     UBFF1910
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CARD NO **** CONTENTS ****

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C     EMPENNAGE RIGID LOADING.                                          USPF1915
  124 YSS(I)=CODIM2(ESS(I),ED,YC,L,.5)                                  USPF1920
      WRITE(6,125)                                                      USPF1925
      IF(NT-6)126,127,127                                               USPF1935
  126 WRITE(6,33)                                                       USPF1940
      GO TO 128                                                         USPF1945
  127 WRITE(6,35)                                                       USPF1950
  128 WRITE(6,57)(ESS(I),YSS(I),I=1,13)                                 USPF1955
C     INTEGRATION OF EMPENNAGE LOADING.                                 USPF1960
      BD(146)=0.0                                                       USPF1965
      DO 129 I=2,13                                                     USPF1970
  129 BD(146)=BD(146)+.5*(ESS(I-1)-ESS(I))*(YSS(I-1)+YSS(I))            USPF1975
      IF(CMN-1.0)133,130,130                                            USPF1980
C     EMPENNAGE SUPERSONIC LIFT CURVE SLOPE (CLAW OR CYBV).             USPF1985
  130 IF(NT-6)131,132,132                                               USPF1990
  131 BU(108)=BS(12)*BD(146)                                            USPF1995
      GO TO 133                                                         USPF2000
  132 BU(167)=BS(12)*BD(146)                                            USPF2005
C     EMPENNAGE DX SWEEP CALCULATIONS.                                  USPF2010
  133 BD(141)=4.0*(1.0-BS(11))*SIN(BS(7)/57.3)*COS(BS(7)/57.3)/(BS(12)*(USPF2015
     1 1.0+BS(11)))                                                     USPF2020
      BD(142)=BS(16)*(1.0-BD(141)*(1.0-BS(16)))                         USPF2025
      BD(143)=BS(3)*(1.0-BD(141)*(1.0-BS(3)))                           USPF2030
      BD(141)=1.0-BD(141)*(1.0-BS(16)-BD(142))                          USPF2035
      BD(144)=(1.0-BS(15)*(1.0-BS(11)))*BS(10)*COS(BS(7)/57.3)/BD(141)  USPF2040
      IF(NT-6)134,135,135                                               USPF2045
  134 K=114                                                             USPF2050
      GO TO 136                                                         USPF2055
  135 K=173                                                             USPF2060
C     EMPENNAGE DX SWEEP AT BODY INTERFACE.                             USPF2065
  136 BD(150)=BD(144)*(BD(143)-BD(142))                                 USPF2070
      DO 139 I=1,13                                                     USPF2075
      K=K+1                                                             USPF2080
      IF(BU(K)-BS(15))137,137,138                                       USPF2085
C     EMPENNAGE DX SWEEP INBD OF BODY INTERFACE.                        USPF2090
  137 DXS(I)=BD(150)+(BS(15)-BU(K))*BS(14)*SIN(BS(7)/57.3)              USPF2095
      GO TO 139                                                         USPF2100
C     EMPENNAGE DX SWEEP OUTBD OF BODY INTERFACE.                       USPF2105
  138 DXS(I)=(BD(143)-BD(142))*(1.0-BU(K)*(1.0-BS(11)))*BS(10)*COS(BS(7)USPF2110
     1/57.3)                                                            USPF2115
  139 CONTINUE                                                          USPF2120
      WRITE(6,140)                                                      USPF2135
      WRITE(6,141)(ESS(I),DXS(I),I=1,13)                                USPF2140
C     ESTABLISH EMPENNAGE UNIT SPANWISE DISTRIBUTIONS.                  USPF2145
      DO 145 I=2,13                                                     USPF2150
      IF(NT-6)142,143,143                                               USPF2155
  142 J=I+127                                                           USPF2160
      GO TO 144                                                         USPF2165
  143 J=I+186                                                           USPF2170
C     NORMALIZ LOADING.                                                 USPF2175
  144 YSS(I)=YSS(I)/BD(146)                                             USPF2180
C     SPANWISE UNIT SHEAR.                                              USPF2185
      BU(J)=BU(J-1)+.5*(ESS(I-1)-ESS(I))*(YSS(I-1)+YSS(I))              USPF2190
C     SPANWISE UNIT BENDING MOMENT.                                     USPF2195
      BU(J+13)=BU(J+12)+.5*BS(14)*(ESS(I-1)-ESS(I))*(BU(J-1)+BU(J))/COS(USPF2200
     1BS(7)/57.3)                                                       USPF2205
C     SPANWISE UNIT TORSION.                                            USPF2210
  145 BU(J+26)=BU(J+25)-.5*(ESS(I-1)-ESS(I))*(YSS(I-1)*DXS(I-1)+YSS(I)*DUSPF2215
     1XS(I))                                                            USPF2220
C     EMPENNAGE UNIT AIRLOADS AT BODY INTERFACE.                        USPF2225
      IF(NT-6)146,147,147                                               USPF2230
  146 I=109                                                             USPF2235
      K=129                                                             USPF2240
      GO TO 148                                                         USPF2245
  147 I=168                                                             USPF2250
      K=188                                                             USPF2255
C     KE(B) AND UNIT SHEAR.                                             USPF2260
  148 BU(I)=CODIM2(BS(15),BU(I+7),BU(K),12,.5)                          USPF2265
      BU(I+3)=BU(I)                                                     USPF2270
C     UNIT SWEPT BENDING MOMENT AND TORSION.                            USPF2275
      BD(148)=CODIM2(BS(15),BU(I+7),BU(K+13),12,.5)                     USPF2280
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CARD NO   ****                        CONTENTS                          ****
          BB(149)=CODINE2(BS(15),BU(I+7),BU(K+26),12,.5)                USPF2285
    C     RESOLVE UNIT SWEPT MOMENTS INTO BODY SYSTEM.                  USPF2290
          BU(I+4)=BB(148)*COS(BS(7)/57.3)+BB(149)*SIN(BS(7)/57.3)       USPF2295
          BU(I+5)=BB(149)*COS(BS(7)/57.3)-BB(148)*SIN(BS(7)/57.3)       USPF2300
    C     EMPENNAGE CENTERS OF PRESSURE.                                USPF2305
          IF(NT-6)149,150,150                                           USPF2310
      149 BU(110)=BU(153)*COS(BS(7)/57.3)+BU(166)*SIN(BS(7)/57.3)       USPF2315
          BU(111)=BS(10)*BS(16)-BU(166)*COS(BS(7)/57.3)+BU(153)*SIN(BS(7)/57USPF2320
         1.3)                                                           USPF2325
          IF(ND(23))151,151,153                                         USPF2330
      150 BU(169)=BU(212)*COS(BS(7)/57.3)+BU(225)*SIN(BS(7)/57.3)       USPF2335
          BU(170)=BS(10)*BS(16)-BU(225)*COS(BS(7)/57.3)+BU(212)*SIN(BS(7)/57USPF2340
         1.3)                                                           USPF2345
          GO TO 156                                                     USPF2350
      151 IF(ND(24))152,152,153                                         USPF2355
      152 IF(ND(27))156,156,153                                         USPF2360
      153 IF(VT-6.0)154,154,155                                         USPF2365
      154 NT=6                                                          USPF2370
          GO TO 9                                                       USPF2375
      155 NT=7                                                          USPF2380
          GO TO 9                                                       USPF2385
      156 IF(ND(23))157,157,160                                         USPF2390
      157 IF(ND(25))158,158,160                                         USPF2395
      158 IF(ND(26))159,159,160                                         USPF2400
      159 IF(ND(27))181,181,171                                         USPF2405
    C     PRINT WING FACTORS AND UNIT SPANWISE DISTRIBUTIONS.           USPF2410
      160 DO 167 I=1,4                                                  USPF2415
          GO TO (161,162,163,164),I                                     USPF2420
      161 WRITE(6,173)BB(10),BU(1)                                      USPF2425
          J=2                                                           USPF2430
          K=13                                                          USPF2435
          GO TO 165                                                     USPF2440
      162 WRITE(6,174)BB(5),BU(61),BB(10)                               USPF2445
          J=62                                                          USPF2450
          K=60                                                          USPF2455
          GO TO 165                                                     USPF2460
      163 WRITE(6,175)BB(5),BB(10)                                      USPF2465
          J=300                                                         USPF2470
          K=356                                                         USPF2475
          GO TO 165                                                     USPF2480
      164 WRITE(6,176)BB(1),BB(2),BB(10)                                USPF2485
          J=404                                                         USPF2490
          K=402                                                         USPF2495
      165 L=J+6                                                         USPF2500
          WRITE(6,177)(BU(M),M=J,L)                                     USPF2505
          DO 166 L=9,21                                                 USPF2510
          M=L+K                                                         USPF2515
      166 WRITE(6,178)BU(L),BU(M),BU(M+13),BU(M+26)                     USPF2520
      167 CONTINUE                                                      USPF2525
          IF(NF)168,168,181                                             USPF2530
      168 IF(ND(23))150,150,169                                         USPF2535
    C     PRINT HOR TAIL FACTORS AND UNIT SPANWISE DISTRIBUTIONS.       USPF2540
      169 WRITE(6,179)CMN,(BU(I),I=108,114)                             USPF2545
          DO 170 L=115,127                                              USPF2550
          M=L+13                                                        USPF2555
      170 WRITE(6,178)BU(L),BU(M),BU(M+13),BU(M+26)                     USPF2560
          IF(ND(23))159,159,171                                         USPF2565
    C     PRINT VERT TAIL FACTORS AND UNIT SPANWISE DISTRIBUTIONS.      USPF2570
      171 WRITE(6,180)CMN,(BU(I),I=167,173)                             USPF2575
          DO 172 L=174,186                                              USPF2580
          M=L+13                                                        USPF2585
      172 WRITE(6,178)BU(L),BU(M),BU(M+13),BU(M+26)                     USPF2590
      181 RETURN                                                        USPF9000
       26 FORMAT(1H1,10X33HVALUES FROM BCLA/K TABLES FOR AR=F8.4,3X4HSWB=F6.2USPF9005
         1,3X3HTR=F7.4,3X5HBA/K=F8.4)                                   USPF9006
       29 FORMAT(1H07X3HTR=4F10.2//11X4F10.5)                           USPF9010
       31 FORMAT(1H+53X6H(WING))                                        USPF9015
       33 FORMAT(1H+53X10H(HOR TAIL))                                   USPF9020
       35 FORMAT(1H+53X11H(VERT TAIL))                                  USPF9025
       41 FORMAT(1H17X3HAR=F8.4,3X3HTR=F7.4,3X3HBA=F8.4,3X3HBM=F8.4)    USPF9030
       42 FORMAT(1H07X3HTR=4F10.2)                                      USPF9035
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CARD NO   ****                        CONTENTS                            ****
          47 FORMAT(1H010X34HVALUES FROM LOADING TABLES FOR MN=F6.3)       USFF9040
          48 FORMAT(1H010X4F10.5,3X4HSTA=F6.3)                             USFF9045
          56 FORMAT(1H110X7HSTATION10X24HLOADING AT DATA STATIONS5X3HMN=F6.3) USFF9050
          57 FORMAT(1H 2F17.5)                                             USFF9055
          66 FORMAT(1H110X7HSTATION10X9HOUTB LONG10X9HINBD LONG10X9HFLAP INCRSXUSFF9060
            13HMN=F6.3,5X3HDF=F6.2)                                        USFF9061
          67 FORMAT(1H F17.5,F18.5,F19.5)                                  USFF9065
          80 FORMAT(1H+94XF10.5)                                           USFF9070
          83 FORMAT(1H1908HANALYSIS,10X8HSTATIONS10X8HLOADING-)            USFF9075
          86 FORMAT(1H+35X21HFLEXIBLE ALPHA EFFECT)                        USFF9080
          87 FORMAT(1H+35X17HRIGID FLAP EFFECT)                            USFF9085
          88 FORMAT(1H+35X26HFLAP AEROELASTIC INCREMENT)                   USFF9090
         101 FORMAT(1H+35X29HINERTIA AEROELASTIC INCREMENT)                USFF9095
         103 FORMAT(1H0908HANALYSIS/10X8HSTATIONS10X8HTOR LOAD)            USFF9100
         104 FORMAT(1H F17.5,F18.4)                                        USFF9105
         125 FORMAT(1H010X7HSTATION10X25HLOADING-ANALYSIS STATIONS)        USFF9110
         140 FORMAT(1H010X7HSTATION10X8HDX SWEEP)                          USFF9115
         141 FORMAT(1H F17.5,F17.3)                                        USFF9120
         173 FORMAT(1H16X30HWING FLEXIBLE ALPHA PARAMETERS4X3HMN=F6.3,4X4HCLA=FUSFF9125
            10.5)                                                          USFF9126
         174 FORMAT(1H16X26HRIGID FLAP DOWN PARAMETERS4X3HDF=F6.2,4X4HKDF=F8.5,USFF9130
            14X3HMN=F6.3)                                                  USFF9131
         175 FORMAT(1H16X27HAEROELASTIC FLAP PARAMETERS4X3HDF=F6.2,4X3HMN=F6.3)USFF9135
         176 FORMAT(1H16X30HAEROELASTIC INERTIA PARAMETERS4X7HWEIGHT=F8.0,4X5HFUSFF9140
            1SCO=F8.2,4X3HMN=F6.3)                                         USFF9141
         177 FORMAT(1H06X8HDXTOTAL=F8.2,4X8HMYW(B)=F7.2,4X7HDXW(B)=F8.2,4X7HDXB(USFF9145
            1W)=F8.2//7X18HSIDE OF BODY UNITS//7X8HUSZWB=F8.5,4X8HUMXWB=F8.3,4XUSFF9146
            28HUMYWB=F8.3//7X27HSPANWISE UNIT DISTRIBUTIONS//8X3HSTA7X7HUSZW(B)USFF9147
            34X7HUMXW(B)4X7HUMYW(B)/8X5HSWEPT18X5HSWEEP8X5HSWEEP/)         USFF9148
         178 FORMAT(1H 8XF7.4,F12.5,2F11.3)                                USFF9150
         179 FORMAT(1H16X19HHOR TAIL PARAMETERS5X3HMN=F6.3//7X4HCLA=F8.5,4X8HKOUSFF9155
            1(B)=F7.5,4X3HYH=F7.2,4X4HDXH=F8.2//7X18HSIDE OF BODY UNITS//7X8HUSUSFF9156
            2ZHB=F8.5,4X8HUMXHB=F8.3,4X8HUMYHB=F8.3//7X27HSPANWISE UNIT DISTRIBUSFF9157
            3UTIONS//8X3HSTA7X7HUSZH(B)4X7HUMXH(B)4X7HUMYH(B)/8X5HSWEPT18X5HSWEUSFF9158
            4EP8X5HSWEEP/)                                                 USFF9159
         180 FORMAT(1H16X20HVERT TAIL PARAMETERS5X3HMN=F6.3//7X4HCYB=F8.5,4X8HKUSFF9165
            1V(B)=F7.5,4X4HDZV=F7.2,4X4HDXV=F8.2//7X17HTOP OF BODY UNITS//7X8HUUSFF9166
            2SYVB=F8.5,4X8HUMXVB=F8.3,4X8HUMZVB=F8.3//7X27HSPANWISE UNIT DISTRIUSFF9167
            3BUTIONS//8X3HSTA7X7HUSYV(B)4X7HUMXV(B)4X7HUMZV(B)/8X5HSWEPT18X5HSUSFF9168
            4EEP8X5HSWEEP/)                                                USFF9169
             END                                                           USFF9999
             SUBROUTINE ATMOS (H,RHOH,PH,AH)                               ATM00010
             PO=14.69595                                                   ATM00020
             RHOO=.0023768198                                              ATM00030
             TMO=518.688                                                   ATM00040
             GO=32.174049                                                  ATM00050
             RO=1718.4027                                                  ATM00060
             RE=20855531.                                                  ATM00070
             IF(H-36152.)30,40,40                                          00000120
          30 GB=0.0                                                        00000130
             TMB=518.688                                                   00000140
             TMDH=-.00356616                                               00000150
             PBASE=14.69595                                                00000155
             GO TO 100                                                     00000160
          40 IF(H-82345.)45,50,50                                          00000170
          45 GB=36089.24                                                   00000180
             TMB=389.988                                                   00000190
             PBASE=3.282471                                                00000195
             GO TO 110                                                     00000200
          50 IF(H-155348.)55,60,60                                         00000210
          55 GB=82021.                                                     00000220
             TMB=389.988                                                   00000230
             TMDH=.00164592                                                00000240
             PBASE=.3809403                                                00000245
             GO TO 100                                                     00000250
          60 IF(H-175346.5)65,70,70                                        00000260
          65 GB=154199.5                                                   00000270
             TMB=508.788                                                   00000280
             PBASE=.01746846                                               00000285
             GO TO 110                                                     00000290
          70 IF(H-249000.0)75,80,80                                        00000300
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CARD NO    ****                       CONTENTS                          ****
        75 GO=172004.5                                                  00000310
           THO=500.700                                                  00000320
           THOH=-.00213000                                              00000330
           PBASE=.00042000I                                             00000335
           GO TO 100                                                    00000340
        80 GO=240063.                                                   00000350
           THO=384.340                                                  00000360
           PBASE=.000375630O                                            00000365
           GO TO 110                                                    00000370
       100 GH=RE*H/(RE+H)                                               00000380
           THH=THO+THOH*(GH-GO)                                         00000390
           YP=-(GO/(RO*THOH))*(ALOG(THH/THO))                           00000400
           PH=PBASE*EXP(YP)                                             00000410
           AH=49.021177*SQRT(THH)                                       00000420
           RHOH=RHOO*PH*THO/(PO*THH)                                    00000430
           GO TO 120                                                    00000440
       110 GH=RE*H/(RE+H)                                               00000450
           THH=THO                                                      00000460
           YP=-GO*(GH-GO)/(RO*THH)                                      00000470
           PH=PBASE*EXP(YP)                                             00000480
           AH=49.021177*SQRT(THH)                                       00000490
           RHOH=RHOO*PH*THO/(PO*THH)                                    00000500
       120 RETURN
           END
           FUNCTION FCODME(X,Y,XI,YI,ZI,N1,N2,NK)                       FCOD0001
C          TWO DIMENSION CURVE FIT SUBPROGRAM....FCODME                 FCOD0010
C          CALLING SEQUENCE                                             FCOD0020
C          Z = FCODME(X,Y,XI,YI,ZI,N1,N2,NK)                            FCOD0030
C              X = ARGUMENT - 1ST VARIABLE                              FCOD0040
C              Y = ARGUMENT - 2ND VARIABLE                              FCOD0045
C             XI = ARRAY OF 1ST VARIABLE                                FCOD0050
C             YI = ARRAY OF 2ND VARIABLE                                FCOD0055
C             ZI = ARRAY OF THE   DEPENDENT VARIABLE                    FCOD0060
C             N1 = NO. OF POINTS - YI                                   FCOD0065
C             N2 = NO. OF POINTS - XI                                   FCOD0070
C             NK = END INTERVAL INTERPOLATION CONTROL CONSTANT          FCOD0075
           COMMON TCOM(4400)                                            FCOD0085
           DIMENSION BD(180),ND(200),XI(1),YI(1),ZI(1),T(4),YX(4)       FCOD0090
           EQUIVALENCE (BD(1),TCOM(2803)),(ND(1),TCOM(4201)),(T(1),BD(81)),(YFCOD0092
          1X(1),BD(85)),(N3,ND(138)),(N4,ND(139)),(I,ND(140)),(K,ND(141)),(L,FCOD0093
          2ND(142))                                                     FCOD0094
       100 IF(N1-4)110,110,120                                          FCOD0095
       110 N3 = 1                                                       FCOD0100
           N4 = N1                                                      FCOD0105
           GO TO 200                                                    FCOD0110
       120 N4 = 4                                                       FCOD0115
           K  = 1                                                       FCOD0120
       125 IF(YI(K)-Y)130,150,150                                       FCOD0125
       130 K = K+1                                                      FCOD0130
           IF(K-N1)125,125,165                                          FCOD0135
       150 IF(K-3)155,155,160                                           FCOD0140
       155 N3 =1                                                        FCOD0145
           GO TO 200                                                    FCOD0150
       160 IF(K-N1)170,165,165                                          FCOD0155
       165 N3 = N1-3                                                    FCOD0160
           GO TO 200                                                    FCOD0165
       170 N3 = K -2                                                    FCOD0170
       200 DO 300 I = 1,N4                                              FCOD0175
           L =(N3-1)*N2 +1                                              FCOD0180
           YX(I) = YI(N3)                                               FCOD0185
           T(I) = CODIME(X,XI,ZI(L),N2,NK)                              FCOD0190
       300 N3 = N3+1                                                    FCOD0195
           FCODME = CODIME(Y,YX,T,N4,NK)                                FCOD0200
           RETURN                                                       FCOD0205
           END                                                          FCOD0210
           FUNCTION CODIME(X,XI,YI,N,NK)                                CODI0010
           COMMON TCOM(4400)                                            CODI0015
           DIMENSION ND(200),XI(1),YI(1)                                CODI020
           EQUIVALENCE (ND(1),TCOM(4201)),(NI,ND(143)),(J,ND(144)),(JJ,ND(145CODI0024
          1)),(K,ND(146)),(L,ND(147)),(M,ND(148))                       CODI0025
           W = X                                                        CODI0027
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CARD NO   ****                      CONTENTS                          ****

1065            NI = N                                              COD10025
1066            IF ( NI-2 ) 105,110,150                             COD10030
1067       105  CODIN2 = YI(NI)                                     COD10035
1068            GO TO 900                                           COD10040
1069       110  NI = 2                                              COD10045
1070       140  CODIN2 = (YI(NI)-YI(NI-1))/(XI(NI)-XI(NI-1)) * (W-XI(NI-1)) +   COD10050
1071           1 YI(NI-1)                                           COD10055
1072            GO TO 900                                           COD10060
1073       150  IF ( XI(1) - XI(2)) 165,165,175                     COD10065
1074       165  DO 170 J = 1,NI                                     COD10070
1075            IF ( W - XI(J)) 190,200,170                         COD10075
1076       170  CONTINUE                                            COD10080
1077            GO TO 185                                           COD10085
1078       175  DO 180 J = 1,NI                                     COD10090
1079            IF ( XI(J) - W ) 190,200,180                        COD10095
1080       180  CONTINUE                                            COD10100
1081       185  NI = N                                              COD10105
1082            GO TO 140                                           COD10110
1083       190  IF ( J - 2 ) 110,210,250                            COD10115
1084       210  J = 3                                               COD10120
1085            JJ = 1                                              COD10125
1086            GO TO 275                                           COD10130
1087       200  CODIN2 = YI(J)                                      COD10135
1088            GO TO 900                                           COD10140
1089       250  IF ( J - NI ) 280,285,185                           COD10145
1090       285  J = NI-1                                            COD10150
1091            JJ = 2                                              COD10155
1092            GO TO 275                                           COD10160
1093       280  JJ = 3                                              COD10165
1094       275 IF(NI-3)290,290,295                                  COD10170
1095       290 J = 3                                                COD10175
1096       295 K = J-1                                              COD10180
1097           M = K-1                                              COD10185
1098           L = J+1                                              COD10190
1099           XIM = XI(M)                                          COD10195
1100           XIK = XI(K)                                          COD10200
1101           XIJ = XI(J)                                          COD10205
1102           A1 = W-XIM                                           COD10210
1103           A2 = W-XIK                                           COD10215
1104           A3 = W-XIJ                                           COD10220
1105           AL = (W-XIK)/(XIJ-XIK)                               COD10225
1106           C1 = A3*A2/((XIM-XIK)*(XIM-XIJ))                     COD10230
1107           C2 = A1*A3/((XIK-XIM)*(XIK-XIJ))                     COD10235
1108           C3 = A2*A1/((XIJ-XIM)*(XIJ-XIK))                     COD10240
1109           P1= C1*YI(M)+C2*YI(K)+C3*YI(J)                       COD10245
1110           IF(NI-3)305,305,310                                  COD10250
1111       305 P2 = P1                                              COD10255
1112           GO TO 315                                            COD10260
1113       310 XIL = XI(L)                                          COD10265
1114           A4 = W-XIL                                           COD10270
1115           C4 = A4*A3/((XIK-XIJ)*(XIK-XIL))                     COD10275
1116           C5 = A2*A4/((XIJ-XIK)*(XIJ-XIL))                     COD10280
1117           C6 = A3*A2/((XIL-XIK)*(XIL-XIJ))                     COD10285
1118           S = AL * YI(J) + (1. - AL) * YI(K)                   COD10290
1119           P2= C4*YI(K)+C5*YI(J)+C6*YI(L)                       COD10295
1120       315 GO TO (320,330,350),JJ                               COD10300
1121       320  P2 = P1                                             COD10305
1122            AL = (W-XI(1))/(XI(2)-XI(1))                        COD10310
1123            S  = AL*YI(2)+ (1.0-AL)*YI(1)                       COD10315
1124            P1 = S + XK*(P2-S)                                  COD10320
1125            GO TO 350                                           COD10325
1126       330  P1 = P2                                             COD10330
1127            AL = (W-XI(NI-1))/(XI(NI)-XI(NI-1))                 COD10335
1128            S = AL*YI(NI) + (1.0-AL)*YI(NI-1)                   COD10340
1129            P2 = S + XK*(P1-S)                                  COD10345
1130       350  E1 =   ABS( P1 - S )                                COD10350
1131            E2 =  ABS(P2-S)                                     COD10355
1132            IF(E1-E2)400,400,410                                COD10360
1133       400  CODIN2 = S                                          COD10365
1134            GO TO 900                                           COD10370
1135       410  BT = (E1*AL)/(E1*AL+(1.-AL)*E2)                     COD10375
```

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CARD NO   ****                         CONTENTS                              ****
1136          CODINE = BT*P2 + (1.-BT)*P1                                    COD10300
1137      800 RETURN                                                         COD10305
1138          END                                                            COD10390
1139          SUBROUTINE WFLEX (AFW,AFWCP,AFWF,AFWDF,F,YEIGJ,EI,GJ,CR,BOZ,BLBS, WFLEX001
1140         1                 ANGLE,FSLERT,ANGEA,FSEA0,WLAMDA,Q,CLAR,EOTA,SW, WFLEX002
1141         2                 NOEIGJ,NS,ICALCS,IPRINS,IPRINA)                WFLEX003
1142    C  PROGRAM TO SOLVE THE STATIC AEROELASTIC PROBLEM FOR SWEEP          WFLEX010
1143          DIMENSION  YEIGJ(20) ,EI(20)    ,GJ(20)    ,SICBAR(10,20)        WFLEX030
1144          DIMENSION  AFW(10,3) ,AFWCP(10,3),D(20,20) ,RLOADS(20,3),        WFLEX032
1145         1           FLOADS(20,3),  DLOADS(20,3)      ,A(25,26)  ,IL(26)   ,WFLEX033
1146         2           AFWF(10,3),F(3,4)    ,AFWDF(10,3)                     WFLEX034
1147          COMMON TCOM(4400)                                                WFLEX038
1148          IF(NS.GT.10.OR.NOEIGJ.GT.20) GO TO 160                           WFLEX050
1149          XOCFWD = 0.15                                                    WFLEX110
1150          XOCAFT = 0.65                                                    WFLEX120
1151          IF(ICALCS.EQ.0) GO TO 40                                         WFLEX130
1152          CALL FLXSIC (SICBAR,YEIGJ,EI,GJ,CR,BOZ,BLBS,ANGLE,FSLERT,ANGEA,  WFLEX150
1153         1            FSEA0,WLAMDA,XOCFWD,XOCAFT,NOEIGJ,NS,IPRINS)        WFLEX160
1154    C  DISTRIBUTE RIGID LOADS TO SIC POINTS                               WFLEX185
1155       40 NPTS = 2*NS                                                      WFLEX192
1156          DENOM = XOCFWD-XOCAFT                                            WFLEX200
1157          DO 65 J=1,3                                                      WFLEX210
1158          DO 65 N=1,NS                                                     WFLEX220
1159          II = 2*N                                                         WFLEX230
1160          I = II-1                                                         WFLEX240
1161          RLOADS(I,J) = AFW(N,J)*(-XOCAFT+AFWCP(N,J))/DENOM                WFLEX250
1162       65 RLOADS(II,J) = AFW(N,J)*(XOCFWD-AFWCP(N,J))/DENOM                WFLEX260
1163    C  FORM D MATRIX = IDENTITY-Q(ALPHA LD*SICBAR)                         WFLEX325
1164          C = CLAR*EOTA*Q*(SW/2.)                                          WFLEX329
1165          DO 80 J=1,NPTS                                                   WFLEX330
1166          DO 70 N=1,NS                                                     WFLEX340
1167          II = 2*N                                                         WFLEX350
1168          I = II-1                                                         WFLEX360
1169          D(I,J) = -C*RLOADS(I,1)*SICBAR(N,J)                              WFLEX370
1170       70 D(II,J) = -C*RLOADS(II,1)*SICBAR(N,J)                            WFLEX380
1171       80 D(J,J) = 1.0+D(J,J)                                              WFLEX390
1172    C  SOLVE AEROELASTIC EQU., D*FLOADS=RLOADS, USING GLSQ                 WFLEX395
1173       90 DO 110 K=1,3                                                     WFLEX400
1174          DO 92 J=1,26                                                     WFLEX402
1175          DO 92 I=1,25                                                     WFLEX404
1176       92 A(I,J) = 0.                                                      WFLEX406
1177          DO 95 J=1,NPTS                                                   WFLEX410
1178          DO 95 I=1,NPTS                                                   WFLEX420
1179       95 A(I,J) = D(I,J)                                                  WFLEX430
1180          NPTS1 = NPTS+1                                                   WFLEX440
1181          DO 100 I=1,NPTS                                                  WFLEX450
1182      100 A(I,NPTS1) = RLOADS(I,K)                                         WFLEX455
1183          CALL GLSQ (A,FLOADS(1,K),IL,NPTS,NPTS,ALPHA,1.E-25,1.E-25)       WFLEX460
1184      110 CONTINUE                                                         WFLEX465
1185    C  WRITEOUT INPUT DATA, D MATRIX, RIGID AND FLEXIBLE LOADS             WFLEX468
1186          IF(IPRINA.EQ.0) GO TO 112                                        WFLEX470
1187          WRITE (6,111) NS,Q,CLAR,EOTA,SW                                  WFLEX471
1188      111 FORMAT (1H1 20X,27H DATA FROM SUBROUTINE WFLEX,//23X, 5H NS =,I13,WFLEX472
1189         1//23X, 4H Q =,1F7.2, 9H LB/FT**2,  //23X, 7H CLAR =,1F8.3,//23X,7HWFLEX473
1190         2 EOTA =,1F8.4,//23X, 5H SW =,1F7.2 , 6H FT**2 )                  WFLEX474
1191          CALL MATRIT (D,NPTS,NPTS,20,1,2,10H(1H1/4X8HD MATRIX))           WFLEX475
1192          CALL MATRIT (RLOADS,NPTS,3,20,1,2,35H(1H131X24HRIGID LOAD DISTRIBUWFLEX476
1193         1TIONS))                                                          WFLEX479
1194          CALL MATRIT (FLOADS,NPTS,3,26,1,2,38H(1H031X27HFLEXIBLE LOAD DISTRWFLEX480
1195         1IBUTIONS))                                                       WFLEX481
1196    C  FORM RIGID, FLEX, DELTA FLEX LOADS, AND F/R RATIOS                  WFLEX510
1197      112 DO 117 J=1,3                                                     WFLEX530
1198          DO 114 K=1,4                                                     WFLEX540
1199      114 F(J,K) = 0.                                                      WFLEX550
1200          DO 115 N=1,NS                                                    WFLEX560
1201          II = 2*N                                                         WFLEX570
1202          I = II-1                                                         WFLEX580
1203          AFWF(N,J) = FLOADS(I,J)+FLOADS(II,J)                             WFLEX590
1204          AFWDF(N,J) = AFWF(N,J)-AFW(N,J)                                  WFLEX595
1205          F(J,1) = F(J,1)+AFW(N,J)                                         WFLEX600
1206      115 F(J,2) = F(J,2)+AFWF(N,J)                                        WFLEX610
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CARD NO **** CONTENTS ****

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            F(J,3) = F(J,2)-F(J,1)                                        WFLEX820
        117 F(J,4) = F(J,2)/F(J,1)                                        WFLEX821
      C  WRITEOUT LOADS ON STRIPS. (RIGID, RIGID X/C, FLEX, AND DELTA FLEX)   WFLEX823
            CALL MATRIT (AFM,NS,3,10,1,2,90H(1H121H0RIGID LOAD ON STRIPS (ALWFLEX826
           1PHA, DELTA FLAP, AND M2)))                                    WFLEX827
            CALL MATRIT (AFMCP,NS,3,10,1,2,94H(1H023X43HCHORDWISE C.P. ON STRIWFLEX829
           1PS (X/C), RIGID LOADS))                                       WFLEX830
            CALL MATRIT (AFMF,NS,3,10,1,2,74H(1H133X23HFLEXIBLE LOAD ON STRIPSWFLEX832
           1))                                                            WFLEX833
            CALL MATRIT (AFMDF,NS,3,10,1,2,30H(1H032X25HDELTA FLEX LOAD ON STRWFLEX835
           1IPS))                                                         WFLEX836
      C  WRITEOUT RIGID, FLEX, DELTA FLEX LOADS, AND F/R RATIOS           WFLEX850
            CALL MATRIT (F,3,4,3,1,1,58H(1H123X44HRIGID, FLEX, DELTA FLEX LOADWFLEX870
           1S, AND F/R RATIOS))                                           WFLEX880
            RETURN                                                        WFLEX890
        100 WRITE (6,105) NS,NOEIGJ                                       WFLEX892
        105 FORMAT (20H1 PROGRAM DIMENSIONS EXCEEDED,/ 8H0 NS =,I13,10H     NOEWFLEX895
           1IGJ =,I13)                                                    WFLEX898
            CALL EXIT                                                     WFLEX700
            STOP                                                          WFLEX710
            END                                                           WFLEX730
            SUBROUTINE FLXSIC (SICBAR,YEIGJ,EI,GJ,CR,BO2,BLBS,ANGLE,FSLERT,   FSIC0010
           1                 ANGEA,FSEAO,WLAMDA,XOCFWD,XOCAFT,NOEIGJ,NS,      FSIC0015
           2                 IPRINS)                                          FSIC0020
      C  THIS SUBROUTINE COMPUTES ELASTIC AXIS GEOM, SIC, DTHEDA, AND SICBAR  FSIC0040
            DIMENSION XLE(20)   ,BL(20)    ,C(20)     ,SICFS(20) ,SICBL(20) ,FSIC0060
           1          XBAR(20)  ,YBAR(20)                                     FSIC0070
            DIMENSION YL(21)    ,EI1(21)   ,GJ1(21)   ,YEIGJ(20) ,EI(20)    ,FSIC0080
           1          GJ(20)    ,FLAMDA(21),DSICB(20,20)    ,DSICT(20,20)   ,FSIC0090
           2          SIC(20,20),TLAMDA(21)                                   FSIC0100
            DIMENSION DTHEDA(10,20) ,SICBAR(10,20)                            FSIC0110
            COMMON TCOM(4400)                                                 FSIC0115
      C  WRITEOUT INPUT DATA, CONTROL CONST, GEOMETRY, AND EI, GJ            FSIC0123
            IF(IPRINS.EQ.0) GO TO 30                                          FSIC0125
            WRITE (6,20) NS,NOEIGJ,CR,BO2,BLBS,ANGLE,FSLERT,ANGEA,FSEAO,WLAMDAFSIC0127
           1           ,XOCFWD,XOCAFT                                         FSIC0128
         20 FORMAT (1H1 24X,28H DATA FROM SUBROUTINE FLXSIC,/ 9H0    NS =,I13,FSIC0129
           1 17X,9H NOEIGJ =,I13,/ 9H0    CR =,1F8.2,9H  IN., 7X,8H BO2 =,1F8.FSIC0130
           22,9H  IN., 8X,7H BLBS =,1F7.2 ,9H  IN.,/ 12H0    ANGLE =,1F7.3,8H FSIC0131
           3 DEG., 4X,8H FSLERT =,1F8.2,9H  IN.,/ 12H0    ANGEA =,1F7.3,8H  DEFSIC0132
           4G., 4X,8H FSEAO =,1F8.2,9H  IN.,/ 13H0    WLAMDA =,1F6.3,10X,9H XOFSIC0133
           5CFWD =,1F6.3,10X,9H XOCAFT =,1F6.3)                              FSIC0134
            CALL MATRIT (YEIGJ,NOEIGJ,1,20,1,2,58H(1H023X45HELASTIC AXIS Y COOFSIC0135
           1RDINATES FOR WING EI AND GJ))                                    FSIC0136
            CALL MATRIT (EI,NOEIGJ,1,20,1,2,12H(1H042X2HEI))                  FSIC0137
            CALL MATRIT (GJ,NOEIGJ,1,20,1,2,12H(1H042X2HGJ))                  FSIC0138
      C  FORM SIC POINT FUSELAGE STATIONS AND BUTT LINE COORDINATES           FSIC0140
         30 DBL = (BO2-BLBS)/(NS*2)                                           FSIC0170
            ANGLER = ANGLE/57.3                                               FSIC0180
            SLOPLE = TAN(ANGLER)                                              FSIC0190
            DO 40 N = 1,NS                                                    FSIC0200
            I = 2*N-1                                                         FSIC0210
            BL(N) = (DBL*I)+BLBS                                              FSIC0220
            XLE(N) = FSLERT+BL(N)*SLOPLE                                      FSIC0230
            C(N) =CR*(1-(BL(N)/BO2)*(1-WLAMDA))                               FSIC0240
            SICFS(I) = XOCFWD*C(N)+XLE(N)                                     FSIC0260
            SICFS(I+1) = XOCAFT*C(N)+XLE(N)                                   FSIC0270
            SICBL(I) = BL(N)                                                  FSIC0280
         40 SICBL(I+1) = BL(N)                                                FSIC0290
      C  CONVERT SIC COORDINATES TO THE SWEPT ELASTIC AXIS SYSTEM             FSIC0310
            IERROR = 0                                                        FSIC0325
            NPTS = 2*NS                                                       FSIC0330
            ANGEAR = ANGEA/57.3                                               FSIC0340
            CANGEA = COS(ANGEAR)                                              FSIC0350
            SANGEA = SIN(ANGEAR)                                              FSIC0360
            DO 50 N=1,NPTS                                                    FSIC0370
            XBAR(N) = (SICFS(N)-FSEAO)*CANGEA-SICBL(N)*SANGEA                 FSIC0380
            YBAR(N) = (SICFS(N)-FSEAO)*SANGEA+SICBL(N)*CANGEA                 FSIC0390
            IF(YBAR(N).LT.0.) IERROR=1                                        FSIC0392
         50 CONTINUE                                                          FSIC0395
            IF(IERROR.EQ.1) GO TO 95                                          FSIC0397
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CARD NO     ****                        CONTENTS                              ****
        C  WRITEOUT SIC COORDINATES                                          FSIC0410
              IF(IPRINS.EQ.0) GO TO 60                                        FSIC0425
           55 CALL MATRIT (SICFS,NPTS,1,20,1,2,32H(1H135X21HSIC FUSELAGE STATIONFSIC0430
             1S))                                                            FSIC0440
              CALL MATRIT (SICBL,NPTS,1,20,1,2,25H(1H039X14HSIC BUTT LINES))   FSIC0450
              CALL MATRIT (XBAR,NPTS,1,20,1,2,41H(1H031X30HSIC ELASTIC AXIS X COFSIC0460
             1ORDINATES))                                                     FSIC0470
              CALL MATRIT (YBAR,NPTS,1,20,1,2,41H(1H031X30HSIC ELASTIC AXIS Y COFSIC0480
             1ORDINATES))                                                     FSIC0490
        C  STOP EXECUTION IF NEGATIVE YBAR HAS BEEN FOUND                      FSIC0493
              IF(IERROR.EQ.0) GO TO 60                                        FSIC0495
              WRITE (6,90)                                                    FSIC0496
           90 FORMAT (23H      EXECUTION STOPPED,/ 81H NEGATIVE VALUE OF Y IN THFSIC0497
             1E SWEPT AXIS SYSTEM HAS BEEN FOUND IN SUBROUTINE FLXSIC )        FSIC0498
              CALL EXIT                                                       FSIC0500
              STOP                                                            FSIC0502
        C  CALCULATION OF SIC MATRIX ELEMENTS                                  FSIC0510
           60 DO 80 J=1,NPTS                                                  FSIC0530
              DLBAR = YBAR(J)/20.                                             FSIC0540
              DLBAR5 = DLBAR*.5                                               FSIC0545
              YL(1) = 0.                                                      FSIC0550
              EI1(1) = EI(1)                                                  FSIC0560
              GJ1(1) = GJ(1)                                                  FSIC0565
              TLAMDA(1) = 1./GJ1(1)                                           FSIC0567
              DO 70 I=2,21                                                    FSIC0570
              YL(I) = DLBAR*(I-1)                                             FSIC0580
              EI1(I) = CODINP (YL(I),YEIGJ,EI,NOEIGJ,0.5)                     FSIC0590
           70 GJ1(I) = CODINP (YL(I),YEIGJ,GJ,NOEIGJ,0.5)                     FSIC0600
              DO 80 K=J,NPTS                                                  FSIC0610
              DSICB(J,K) = 0.                                                 FSIC0620
              DSICT(J,K) = 0.                                                 FSIC0630
              FLAMDA(1) = YBAR(K)*YBAR(J)/EI1(1)                              FSIC0640
              TCONST = XBAR(J)*XBAR(K)*DLBAR*.5                               FSIC0650
              DO 75 I=2,21                                                    FSIC0660
              TESTI = YBAR(K)-YL(I)                                           FSIC0661
              TLAMDA(I) = 1./GJ1(I)                                           FSIC0663
              IF(TESTI) 72,74,74                                              FSIC0665
           72 TESTI = 0.                                                      FSIC0667
              TLAMDA(I) = 0.                                                  FSIC0668
           74 FLAMDA(I) = (TESTI*(YBAR(J)-YL(I))/EI1(I))                      FSIC0670
              DSICB(J,K) = DSICB(J,K)+(FLAMDA(I-1)+FLAMDA(I))*DLBAR5          FSIC0680
           75 DSICT(J,K) = DSICT(J,K)+TCONST*(TLAMDA(I-1)+TLAMDA(I))          FSIC0690
              DSICB(K,J) = DSICB(J,K)                                         FSIC0694
              DSICT(K,J) = DSICT(J,K)                                         FSIC0695
              SIC(J,K) = DSICB(J,K)+DSICT(J,K)                                FSIC0700
              SIC(K,J) = SIC(J,K)                                             FSIC0710
           80 CONTINUE                                                        FSIC0720
        C  WRITEOUT SIC MATRICES                                              FSIC0740
              IF(IPRINS.EQ.0) GO TO 82                                        FSIC0750
              CALL MATRIT (DSICB,NPTS,NPTS,20,1,1,38H(1H137X27HDELTA SIC, BENDINFSIC0760
             1G   IN/LB))                                                     FSIC0770
              CALL MATRIT (DSICT,NPTS,NPTS,20,1,1,38H(1H137X27HDELTA SIC, TORSIOFSIC0780
             1N   IN/LB))                                                     FSIC0790
              CALL MATRIT (SIC,NPTS,NPTS,20,1,1,53H(1H131X42HSTRUCTURAL INFLUENCFSIC0800
             1E COEFFICIENTS   IN/LB))                                        FSIC0810
        C  FORM DTHEDA MATRIX                                                 FSIC0830
           82 DO 85 J=1,NPTS                                                  FSIC0850
              DO 85 I=1,NS                                                    FSIC0860
           85 DTHEDA(I,J) = 0.0                                               FSIC0870
              K = 0                                                           FSIC0880
              DO 90 I=2,NPTS,2                                                FSIC0890
              DELTX = SICFS(I)-SICFS(I-1)                                     FSIC0900
              J = I/2                                                         FSIC0910
              K = K+1                                                         FSIC0920
              DTHEDA(J,K) = 1./DELTX                                          FSIC0930
              K = K+1                                                         FSIC0940
           90 DTHEDA(J,K) =-1./DELTX                                          FSIC0950
        C  FORM SICBAR = DTHEDA*SIC, MATRIX MULTPLICATION                     FSIC0970
              DO 100 K=1,NPTS                                                 FSIC0990
              DO 100 I=1,NS                                                   FSIC1000
              SICBAR(I,K) = 0.0                                               FSIC1010
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CARD NO   ****                    CONTENTS                              ****
              DO 100 J=1,NPTS                                          FSIC1020
          100 SICBAR(I,K) = SICBAR(I,K)+OMEGA(I,J)*SIC(J,K)            FSIC1030
        C  WRITEOUT OMEGA AND SICBAR MATRICES                          FSIC1050
              IF(IPRINS.EQ.0) GO TO 150                                FSIC1065
              CALL MATRIT (OMEGA,NP,NPTS,10,1,1,29H(1H1//1X13HOMEGA MATRIX))  FSIC1070
              CALL MATRIT (SICBAR,NS,NPTS,10,1,1,39H(1H1//1X23HSICBAR MATRIX  NFSIC1080
             1AD/LB))                                                  FSIC1081
          150 RETURN                                                   FSIC1100
              END                                                      FSIC1120
              SUBROUTINE GLS0(A,X,IL,N,M,ALPHA,E1,E2)                  GLS00010
              DIMENSION A(25,26),X(26),IL(26)                          GLS00015
              MM=M+1                                                   GLS00020
              LL=1                                                     GLS00025
              DO 60 J=1,MM                                             GLS00030
          60  IL(J)=0                                                  GLS00035
              I=1                                                      GLS00040
              DO 3 K=1,MM                                              GLS00045
              II=I+1                                                   GLS00050
              DO 4 J=II,N                                              GLS00055
              IF ( ABS(A(J,K))-E1)4,4,6                                GLS00060
          6   T1= SQRT((A(J,K))**2+(A(I,K))**2)                        GLS00065
              S=A(J,K)/T1                                              GLS00070
              C=A(I,K)/T1                                              GLS00075
              DO 5 L=K,MM                                              GLS00080
              T2=C*A(I,L)+S*A(J,L)                                     GLS00085
              A(J,L)=-S*A(I,L)+C*A(J,L)                                GLS00090
          5   A(I,L)=T2                                                GLS00095
              LL=LL+1                                                  GLS00100
          4   CONTINUE                                                 GLS00105
              IF ( ABS(A(I,K))-E2)3,3,8                                GLS00110
          8   IL(K)=1                                                  GLS00115
              I=I+1                                                    GLS00120
          3   CONTINUE                                                 GLS00125
              X(MM)=-1.0                                               GLS00130
              II=M                                                     GLS00135
              DO 35 I=1,M                                              GLS00140
          35  X(I)=0.                                                  GLS00145
              DO 30 J=1,M                                              GLS00150
              IF (IL(II))30,30,31                                      GLS00155
          31  S=0.                                                     GLS00160
              LL=II+1                                                  GLS00165
              I=IL(II)                                                 GLS00170
              DO 32 K=LL,MM                                            GLS00175
          32  S=S+A(I,K)*X(K)                                          GLS00180
              X(II)=-S/A(I,II)                                         GLS00185
          30  II=II-1                                                  GLS00190
              IF (IL(MM))50,51,50                                      GLS00195
          51  ALPHA=0.                                                 GLS00200
              GO TO 52                                                 GLS00205
          50  I=IL(MM)                                                 GLS00210
              ALPHA=A(I,MM)                                            GLS00215
          52  RETURN                                                   GLS00220
              END                                                      GLS00225
              SUBROUTINE MATRIT(AMN,NR,NC,NRMAX,MTYPE,IPRIN,HEAD)      MRIT0010
        C  AMN = MATRIX NAME                                           MRIT0030
        C  NR = NUMBER OF ROWS IN AMN                                  MRIT0040
        C  NC = NUMBER OF COLS IN AMN                                  MRIT0050
        C  NRMAX = MAXIMUM NO. OF ROWS IN AMN, DIMENSION IN CALLING PROGRAM  MRIT0060
        C  MTYPE = 1 (REAL MATRIX), -1 (COMPLEX MATRIX)                MRIT0070
        C  IPRIN = 1 (PRINT BY ROWS), 2 (PRINT BY COLUMNS)             MRIT0080
        C  HEAD = FORMAT OF MATRIX HEADING, EXAMPLE. 22H(1H120X11HMASS MATRIX)  MRIT0090
              DIMENSION  AMN(1),HEAD(100)                              MRIT0110
              WRITE(6,HEAD)                                            MRIT0130
              IF(IPRIN -2) 50,10,10                                    MRIT0150
        C  PRINT BY COLUMNS                                            MRIT0160
           10 DO 30 J=1,NC                                             MRIT0170
              N = (J-1)*NRMAX+1                                        MRIT0180
              NLAST = N+NR-1                                           MRIT0190
           30 WRITE(6,105) J,(AMN(I),I=N,NLAST)                        MRIT0200
              GO TO 80                                                 MRIT0210
        C  PRINT BY ROWS                                               MRIT0220
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CARD NO     ****                      CONTENTS                              ****
         50 NC1 = NRMAX+NC                                                  WRIT0230
            DO 70 II=1,NR                                                   WRIT0240
         70 WRITE(6,110) II,(A(II,I),I=I1,NC1,NRMAX)                        WRIT0250
         80 RETURN                                                          WRIT0270
        105 FORMAT(1H05X12HCOLUMN NO. =I4//(1H 1P8E13.5))                   WRIT0290
        110 FORMAT(1H05X9HROW NO. =I4//(1H 1P8E13.5))                       WRIT0300
            END                                                             WRIT0320
            SUBROUTINE BNLDF                                                BNLDF001
      C     BASIC LOADS SUBROUTINE FOR SWEEP II STAND ALONE PROGRAM.        BNLDF002
      C     COMPUTES COMPONENT TOTAL AIRLOADS AND THE CENTERS OF PRESSURE.  BNLDF003
      C     COMPUTES APPLICABLE INERTIA FACTORS.                            BNLDF004
            COMMON TCOM(4400)                                               BNLDF007
            DIMENSION DF(148),BC(195),BB(20),BS(20),BO(160),BU(500),BO(340),NDBNLDF010
           1(200),F(3,4)                                                    BNLDF011
            EQUIVALENCE (DF(1),TCOM(1000)),(BC(1),TCOM(2750)),(BB(1),TCOM(2953BNLDF015
           1)),(BS(1),TCOM(2973)),(BO(1),TCOM(2993)),(BU(1),TCOM(3153)),(BO(1)BNLDF016
           2,TCOM(3853)),(ND(1),TCOM(4201)),(F(1,1),BU(348)),(NI,ND(106)),(IP,BNLDF017
           3ND(137)),(NT,ND(150)),(I,ND(151)),(J,ND(152)),(K,ND(153))       BNLDF018
            BS(11)=0.0                                                      BNLDF020
      C     SELECTION OF WING AREA, FUS STA OF LE AT CL, SPAN, AND HOP HEIGHT.BNLDF025
            IF(IP)3,1,3                                                     BNLDF030
          1 BS(1)=BC(95)                                                    BNLDF035
            BS(2)=BC(90)                                                    BNLDF040
            BS(3)=BC(86)                                                    BNLDF045
            DO 2 I=109,118                                                  BNLDF050
          2 BS(11)=BS(11)+BC(I)                                             BNLDF055
            GO TO 5                                                         BNLDF060
          3 BS(1)=BC(53)                                                    BNLDF065
            BS(2)=BC(48)                                                    BNLDF070
            BS(3)=BC(94)                                                    BNLDF075
            DO 4 I=67,76                                                    BNLDF080
          4 BS(11)=BS(11)+BC(I)                                             BNLDF085
      C     INTERPOLATE DF DATA FOR KCF. COMPUTE PZN/PZWI AND FACTORS A TO F. BNLDF090
          5 BS(12)=CODIM2(BC(43),DF(1),DF(11),5,.5)                         BNLDF095
            BS(4)=.043633*BC(38)**2/(BS(1)*BU(1))                           BNLDF100
            BS(5)=1.0+BS(4)                                                 BNLDF105
            BS(6)=BB(2)-BS(2)-BU(2)+BS(4)*(BB(2)-BC(36)-BC(37)+BC(38)/(3.14159BNLDF110
           1*BC(38)**2))                                                    BNLDF115
            BS(7)=BB(2)-BS(2)-BU(62)                                        BNLDF120
            BS(8)=BB(2)-BS(2)-BU(358)                                       BNLDF125
            BS(9)=BB(2)-BS(2)-BU(404)                                       BNLDF130
            BS(10)=BB(2)-BC(131)-BU(111)                                    BNLDF135
      C     COMPUTE RIGID FLAP, AERO. FLAP, AND AERO. INERTIA TOTAL AIRLOADS. BNLDF140
            BS(14)=BB(5)*BS(12)*BU(61)*BB(10)*BB(17)*BS(1)/57.3             BNLDF145
            BS(15)=BU(86)*BS(14)*(F(2,4)-1.0)                               BNLDF150
            BS(16)=-2.0*BS(11)*BB(6)*(F(3,4)-1.0)                           BNLDF155
      C     FOR PA COND, COMPUTE DPZH QDOT AND EFFECTIVE LOAD FACTOR (NI=5).  BNLDF160
            IF(NI-5)7,6,7                                                   BNLDF165
          6 BS(20)=-(BB(7)*BB(3)*12.0)/(BU(111)+BC(131)-BB(2))              BNLDF170
            BB(20)=BB(6)-BS(20)/BB(1)                                       BNLDF175
            GO TO 8                                                         BNLDF180
          7 BS(20)=0.0                                                      BNLDF185
            BB(20)=BB(6)                                                    BNLDF190
      C     COMPUTE FLEX ALPHA, HOR TAIL, AND BODY NOSE TOTAL AIRLOADS.      BNLDF195
          8 BS(13)=-(BB(20)*BB(1)*BS(10)+BS(14)*(BS(7)-BS(10))+BS(15)*(BS(8)-BBNLDF200
           1S(10))+BS(16)*(BS(9)-BS(10)))/(BS(6)-BS(5)*BS(10))              BNLDF205
            BS(17)=BS(20)+BB(20)*BB(1)-BS(13)*BS(5)-BS(14)-BS(15)-BS(16)    BNLDF210
            BO(3)=BS(4)*BS(13)                                              BNLDF215
            BO(5)=BC(36)+BC(37)-BC(38)/(3.14159*BC(38)**2)                  BNLDF220
            BO(11)=.5*BS(17)                                                BNLDF225
            BO(13)=BC(131)+BU(111)                                          BNLDF230
      C     COMPUTE WING AND HOR TAIL AIRLOAD FACTORS FOR SPABMF.           BNLDF235
            BU(450)=BS(13)                                                  BNLDF240
            BU(451)=BS(14)                                                  BNLDF245
            BU(452)=BS(15)                                                  BNLDF250
            BU(453)=BS(16)                                                  BNLDF255
            BU(454)=BS(17)                                                  BNLDF260
      C     COMPUTE NET PANEL AIRLOADS AND CENTERS OF PRESSURE.             BNLDF265
            BO(6)=.5*(BS(13)*BU(6)+BS(14)*BU(66)+BS(15)*BU(362)+BS(16)*BU(408)BNLDF270
           1)                                                               BNLDF271
            BO(7)=.5*(BS(13)*BU(3)*BU(6)+BS(14)*BU(66)*BU(63)+BS(15)*BU(362)*BBNLDF275
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CARD NO   ****                        CONTENTS                        ****
1491          1U(380)+BS(16)*BU(408)*BU(405))/BD(6)                    BNLDF280
1492          BD(8)=.5*(BS(13)*BU(6)*(BS(2)+BU(4))+BS(14)*BU(86)*(BS(2)+BU(84))+BNLDF285
1493          1BS(15)*BU(362)*(BS(2)+BU(380))+BS(16)*BU(408)*(BS(2)+BU(406)))/BD(BNLDF290
1494          26)                                                      BNLDF291
1495          BD(9)=BS(13)+BS(14)+BS(15)+BS(16)-2.0*BD(8)              BNLDF295
1496          BD(10)=(BS(13)*(BS(2)+BU(2))+BS(14)*(BS(2)+BU(82))+BS(15)*(BS(2)+BBNLDF300
1497          1U(380))+BS(16)*(BS(2)+BU(404))-2.0*BD(6)*BD(8))/BD(9)   BNLDF305
1498          BD(12)=BU(110)                                           BNLDF310
1499    C     DMXV DUE TO ASSYMETRIC HOR TAIL LOAD.                    BNLDF315
1500          BD(14)=ABS(.30*BD(11)*BD(12))                            BNLDF320
1501          BD(17)=BC(152)+BU(170)                                   BNLDF322
1502          BD(19)=0.0                                               BNLDF324
1503          BD(20)=0.0                                               BNLDF326
1504          BD(21)=0.0                                               BNLDF328
1505          GO TO (21,9,9,16,19,20),NI                               BNLDF330
1506    C     VERTICAL GUST CALCULATIONS. MU, AND SUBSONIC OR SUPERSONIC KG.   BNLDF335
1507        9 BS(10)=BD(1)*BS(3)/(16.1*BD(92)*BU(1)*BS(1)**2)          BNLDF340
1508          IF(BB(10)-1.0)10,11,11                                   BNLDF345
1509       10 BS(19)=.88*BS(10)/(5.3+BS(10))                           BNLDF350
1510          GO TO 12                                                 BNLDF355
1511       11 BS(19)=BS(10)**1.03/(6.95+BS(10)**1.03)                  BNLDF360
1512    C     INCREMENTAL LOADS DUE TO + VERT GUST.                    BNLDF365
1513       12 BD(151)=BB(18)*BC(30)**2/228.37535                       BNLDF370
1514          BD(152)=.100394*BS(19)*BU(6)*BU(1)*BS(1)*BB(19)          BNLDF375
1515          BD(153)=BD(152)*(1.0-BU(8))/BU(6)                        BNLDF380
1516          BD(154)=.100394*BS(19)*BU(100)*BC(135)*BB(19)            BNLDF385
1517    C     REVERSE SIGN OF LOADS FOR - VERT GUST (NI=3).            BNLDF390
1518          IF(NI-3)15,13,15                                         BNLDF395
1519       13 DO 14 I=151,154                                          BNLDF400
1520       14 BD(I)=-BD(I)                                             BNLDF405
1521       15 BS(13)=BS(13)+BD(152)+BD(153)                            BNLDF407
1522          BS(17)=BS(17)+BD(154)                                    BNLDF410
1523    C     VERTICAL GUST INERTIA FACTORS.                           BNLDF412
1524          BD(18)=(BS(5)*BS(13)+BS(17))/(BB(1)-BS(18))              BNLDF414
1525          BS(18)=BS(16)*BD(18)                                     BNLDF416
1526          BD(3)=BD(3)+BD(151)                                      BNLDF420
1527          BD(20)=(BD(3)*(BB(2)-BD(5))+BS(13)*(BB(2)-BS(2)-BU(2))+BS(17)*BS(BBNLDF425
1528         1*BS(17)*BS(10))/(12.0*BB(3))                             BNLDF426
1529    C     COMPUTE COMPONENT TOTAL AIRLOADS FOR VERTICAL GUST CONDITIONS.   BNLDF430
1530          BD(8)=.5*(BU(6)*BS(13)+BU(86)*BS(14)+BU(362)*BS(15)+BU(408)*BS(16)BNLDF435
1531         1)                                                        BNLDF436
1532          BD(9)=BS(13)+BS(14)+BS(15)+BS(16)-2.0*BD(8)              BNLDF440
1533          BD(11)=.5*BS(17)                                         BNLDF445
1534          BD(14)=ABS(.30*BD(11)*BD(12))                            BNLDF450
1535          BU(450)=BS(13)                                           BNLDF455
1536          BU(453)=BS(16)                                           BNLDF460
1537          BU(454)=BS(17)                                           BNLDF465
1538          GO TO 22                                                 BNLDF470
1539    C     LATERAL GUST CALCULATIONS WITH UDE=50 FPS (NI=4).        BNLDF475
1540       16 BD(4)=.0043788*BB(18)*BC(39)**2                          BNLDF480
1541          BD(15)=.100394*BU(167)*BC(156)*BB(19)                    BNLDF485
1542          IF(ND(15))18,17,18                                       BNLDF490
1543    C     DUAL VERT TAIL.                                          BNLDF495
1544       17 BD(15)=BD(15)*2.                                         BNLDF500
1545       18 BD(16)=BU(168)                                           BNLDF505
1546          BD(19)=(BD(4)+BD(15))/BB(1)                              BNLDF510
1547          BD(21)=(BD(4)*(BB(2)-BD(5))-BD(15)*(BD(17)-BB(2)))/(BB(4)*12.)   BNLDF515
1548          GO TO 21                                                 BNLDF520
1549    C     PITCHING ACCELERATION (NI=5).                            BNLDF525
1550       19 BD(20)=BB(7)                                             BNLDF530
1551          GO TO 21                                                 BNLDF535
1552    C     YAWING ACCELERATION (NI=6).                              BNLDF540
1553       20 BD(15)=-(BB(8)*BB(4)*12.)/(BD(17)-BB(2))                 BNLDF545
1554          BD(16)=BU(168)                                           BNLDF550
1555          BD(19)=BD(15)/BB(1),                                     BNLDF555
1556          BD(21)=BB(8)                                             BNLDF560
1557       21 BD(18)=BB(6)                                             BNLDF565
1558       22 IF(ND(23))23,23,24                                       BNLDF570
1559       23 IF(ND(24))25,25,24                                       BNLDF575
1560       24 WRITE(6,26)BD(2),BB(18),BB(9),BB(5)                      BNLDF580
1561          WRITE(6,27)(BD(I),I=3,5)                                 BNLDF585
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CARD NO   ****                       CONTENTS                          ****

1562          WRITE(6,28)(BD(I),I=6,8)                                 BWLDF590
1563          WRITE(6,29)BD(9),BD(10)                                  BWLDF595
1564          WRITE(6,30)(BD(I),I=11,14)                               BWLDF600
1565          WRITE(6,31)(BD(I),I=15,17)                               BWLDF605
1566          WRITE(6,32)(BD(I),I=18,21)                               BWLDF610
1567          WRITE(6,33)(BU(I),I=450,454)                             BWLDF615
1568       25 RETURN                                                   BWLDF620
1569       26 FORMAT(1H1GX13HCONDITION NO=F7.0,5X3HMN=F6.3,5HWALT=F7.0,5X3HQF=FBWLDF905
1570         18.2)                                                     BWLDF906
1571       27 FORMAT(1H0GX10HBODY LOADS/7X4HPZN=F8.0,4X4HPYN=F7.0,4X4HMBN=F8.2/)BWLDF910
1572       28 FORMAT(1H0GX15HWING PANEL LOAD/7X8HPZW(B)/2=F9.0,4X7HYBW(B)=F7.2,4BWLDF915
1573         1X7HMBW(B)=F8.2/)                                         BWLDF916
1574       29 FORMAT(1H0GX20HWING CARRY-OVER LOAD/7X7HPZB(W)=F8.0,4X7HMBB(W)=F8.BWLDF920
1575         12/)                                                      BWLDF921
1576       30 FORMAT(1H0GX21HHORIZONTAL TAIL LOADS/7X8HPZH/2=F8.0,4X4HYBH=F6.2,4BWLDF925
1577         1X4HMBH=F8.2,4X5HTORH=F9.0/)                              BWLDF926
1578       31 FORMAT(1H0GX19HVERTICAL TAIL LOAD/7X4HPYV=F8.0,4X4HZBV=F6.2,4X4HMBBWLDF930
1579         1V=F8.2/)                                                 BWLDF931
1580       32 FORMAT(1H0GX24HAIRPLANE INERTIA FACTORS/7X3HNZ=F6.2,4X3HNY=F6.2,4XBWLDF935
1581         19HQDOT=F7.3,4X5HRDOT=F7.3/)                              BWLDF936
1582       33 FORMAT(1H0GX28HCOMPONENT SPANWISE FACTORS/7X8HPZWB1=F8.0,5X8HPZWB2BWLDF940
1583         1=F9.0,5X8HPZWB3=F8.0,5X8HPZWB4=F8.0,5X5HPZHB=F8.0)       BWLDF941
1584          END                                                      BWLDF999
1585          SUBROUTINE SPABF                                         SPABF001
1586    C     SUBROUTINE SPABF FOR STAND ALONE LOADS MODULE OF SWEEP II.        SPABF002
1587    C     CALCULATES WING AND EMPENNAGE SPANWISE AIRLOAD SHEAR,BEND MOM,TOR.SPABF003
1588    C     AIRLOADS INCLUDE THE EFFECTS OF WING FLEXIBILITY.        SPABF004
1589          COMMON TCOM(4400)                                        SPABF006
1590          DIMENSION BB(20),BC(195),BD(348),BD(160),BU(500),ND(200) SPABF009
1591          EQUIVALENCE (BC(1),TCOM(2758)),(BB(1),TCOM(2953)),(BD(1),TCOM(2993SPABF012
1592         1)),(BU(1),TCOM(3153)),(BD(1),TCOM(3853)),(ND(1),TCOM(4201)),(IP,NDSPABF013
1593         2(137)),(ID,ND(154)),(I,ND(155)),(J,ND(156)),(K,ND(157)),(L,ND(158)SPABF014
1594         3),(M,ND(159))                                            SPABF015
1595          DO 32 I=22,180                                           SPABF017
1596       32 BD(I)=0.0                                                SPABF018
1597          IF(ND(23))1,1,2                                          SPABF020
1598        1 IF(ND(25))10,10,2                                        SPABF025
1599    C     SET UP PARAMETERS TO DO WING LOADS.                      SPABF030
1600        2 BD(22)=BB(15)+BB(12)                                     SPABF033
1601          BD(23)=BC(40)                                            SPABF035
1602          J=24                                                     SPABF040
1603          IF(IP)4,3,4                                              SPABF045
1604        3 I=88                                                     SPABF050
1605          K=80                                                     SPABF055
1606          GO TO 5                                                  SPABF060
1607        4 I=94                                                     SPABF065
1608          K=47                                                     SPABF070
1609        5 BD(156)=6.*BC(I)                                         SPABF075
1610          BD(157)=BC(K)                                            SPABF080
1611          I=0                                                      SPABF085
1612          DO 6 K=1,12                                              SPABF090
1613          L=I+K+20                                                 SPABF095
1614          BD(L)=BD(156)*BU(K+8)/COS(BD(157)/57.3)                  SPABF100
1615        6 I=I+3                                                    SPABF105
1616    C     ID=1 FLEXIBLE ALPHA EFFECTS.                             SPABF110
1617          ID=1                                                     SPABF115
1618          BD(195)=.5*BU(450)                                       SPABF120
1619          I=6                                                      SPABF125
1620          K=82                                                     SPABF130
1621          GO TO 29                                                 SPABF135
1622    C     ID=2 RIGID FLAP EFFECTS.                                 SPABF140
1623        7 ID=2                                                     SPABF145
1624          BD(195)=.5*BU(451)                                       SPABF150
1625          I=66                                                     SPABF155
1626          K=69                                                     SPABF160
1627          GO TO 29                                                 SPABF165
1628    C     ID=3 AEROELASTIC FLAP EFFECTS.                           SPABF170
1629        8 ID=3                                                     SPABF175
1630          BD(195)=.5*BU(452)                                       SPABF180
1631          I=362                                                    SPABF185
1632          K=365                                                    SPABF190
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CARD NO   ****                          CONTENTS                              ****

 1633            GO TO 20                                                     SPABF195
 1634     C      ID=4 AEROELASTIC INERTIA EFFECTS.                            SPABF200
 1635          9 ID=4                                                         SPABF205
 1636            BD(195)=.5*BU(453)                                           SPABF210
 1637            I=408                                                        SPABF215
 1638            K=411                                                        SPABF220
 1639            GO TO 29                                                     SPABF225
 1640         10 IF(ND(23))11,11,12                                           SPABF230
 1641         11 IF(ND(28))14,14,12                                           SPABF235
 1642     C      SET UP HORIZONTAL TAIL PARAMETERS (ID=5).                    SPABF240
 1643         12 ID=5                                                         SPABF245
 1644            BD(75)=BD(15)+BD(13)                                         SPABF247
 1645            BD(76)=BC(137)                                               SPABF250
 1646            BD(195)=.5*BU(454)                                           SPABF255
 1647            BD(156)=6.*BC(138)                                           SPABF260
 1648            BD(157)=BC(139)                                              SPABF265
 1649            I=0                                                          SPABF270
 1650            DO 13 K=1,12                                                 SPABF275
 1651            L=I+K+78                                                     SPABF280
 1652            BD(L)=BD(156)*BU(K+114)/COS(BD(157)/57.3)                    SPABF285
 1653         13 I=I+3                                                        SPABF290
 1654            I=112                                                        SPABF295
 1655            J=77                                                         SPABF300
 1656            K=180                                                        SPABF305
 1657            GO TO 29                                                     SPABF310
 1658         14 IF(ND(23))15,15,16                                           SPABF315
 1659         15 IF(ND(27))31,3 ,16                                           SPABF320
 1660     C      SET UP VERTICAL TAIL PARAMETERS.                             SPABF325
 1661         16 BD(128)=BD(15)+BD(14)                                        SPABF327
 1662            BD(129)=BC(150)                                              SPABF330
 1663            IF(ND(15))17,18,19                                           SPABF335
 1664     C      SINGLE VERTICAL TAIL. CONSIDER INTRA-SPAN HOR TAIL PLANE.    SPABF340
 1665         17 ID=7                                                         SPABF345
 1666            GO TO 20                                                     SPABF350
 1667     C      DUAL VERTICAL TAIL. NO INTRA-SPAN HOR TAIL PLANE CONSIDERED. SPABF355
 1668         18 ID=6                                                         SPABF360
 1669            BD(195)=.95*BD(15)                                           SPABF365
 1670            GO TO 21                                                     SPABF370
 1671     C      T VERTICAL TAIL. HOR TAIL PLANE AT VERT TAIL TIP.            SPABF375
 1672         19 ID=8                                                         SPABF380
 1673         20 BD(195)=BD(15)                                               SPABF385
 1674         21 BD(156)=12.*BC(157)                                          SPABF390
 1675            BD(157)=BC(151)                                              SPABF395
 1676            I=0                                                          SPABF400
 1677            DO 22 K=1,12                                                 SPABF405
 1678            L=I+K+132                                                    SPABF410
 1679            BD(L)=BD(156)*BU(K+173)/COS(BD(157)/57.3)                    SPABF415
 1680         22 I=I+3                                                        SPABF420
 1681            I=171                                                        SPABF425
 1682            J=130                                                        SPABF430
 1683            K=187                                                        SPABF435
 1684            IF(ID-7)29,23,25                                             SPABF440
 1685     C      SINGLE VERT TAIL. CHECK IF HOR TAIL PLANE AT/OUTBD OF TOP OF BODY.SPABF445
 1686         23 IF(BC(159)-BC(158))29,24,24                                  SPABF450
 1687     C      SWEPT STATION OF HOR TAIL PLANE.                             SPABF455
 1688         24 BD(198)=BC(159)/COS(BD(157)/57.3)                            SPABF460
 1689     C      ASSYMMETRIC HOR TAIL LOAD EFFECT AT BODY INTERFACE.          SPABF465
 1690         25 BD(131)=BD(14)                                               SPABF470
 1691     C      SPANWISE EFFECT OF ASSYMMETRIC HOR TAIL LOAD.                SPABF475
 1692            DO 28 L=175,178,4                                            SPABF480
 1693            IF(ID-7)29,26,27                                             SPABF485
 1694     C      SINGLE VERT TAIL. CHECK IF HOR TAIL PLANE AT/OUTBD OF STA(L-2). SPABF490
 1695         26 IF(BD(198)-BD(L-2))28,27,27                                  SPABF495
 1696     C      INCLUDE EFFECT. ALWAYS FOR T TAIL.                           SPABF500
 1697         27 BD(L)=BD(14)*COS(BD(157)/57.3)                               SPABF505
 1698            BD(L+1)=BD(14)*SIN(BD(157)/57.3)                             SPABF510
 1699         28 CONTINUE                                                     SPABF515
 1700     C      NET AIRLOADS AT BODY INTERFACE.                              SPABF520
 1701         29 BD(J)=BD(J)+BD(195)*BU(I)                                    SPABF525
 1702            BD(J+1)=BD(J+1)+BD(195)*BU(I+1)                              SPABF530
 1703            BD(J+2)=BD(J+2)+BD(195)*BU(I+2)                              SPABF535
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CARD NO **** CONTENTS ****

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C     SPANWISE NET AIRLOAD DISTRIBUTIONS.                               SPABF540
      DO 30 L=2,46,4                                                    SPABF545
      M=J+L+2                                                           SPABF550
      BD(M)=BD(M)+BD(195)*BU(K)                                         SPABF555
      BD(M+1)=BD(M+1)+BD(195)*BU(K+13)                                  SPABF560
      BD(M+2)=BD(M+2)+BD(195)*BU(K+26)                                  SPABF565
   30 K=K+1                                                             SPABF570
      GO TO (7,8,9,10,14,31,31,31),I0                                   SPABF575
   31 IF(ND(23))33,33,34                                                SPABF580
   33 IF(ND(25))35,35,34                                                SPABF585
   34 WRITE(6,42)BD(22),BD(10),BD(9),BD(5)                              SPABF590
      WRITE(6,43)(BD(I),I=23,26)                                        SPABF595
      WRITE(6,44)(BD(I),I=27,74)                                        SPABF600
   35 IF(ND(23))36,36,37                                                SPABF605
   36 IF(ND(26))38,38,37                                                SPABF610
   37 WRITE(6,45)BD(75),BD(10),BD(9)                                    SPABF615
      WRITE(6,43)(BD(I),I=76,79)                                        SPABF620
      WRITE(6,44)(BD(I),I=80,127)                                       SPABF625
   38 IF(ND(23))39,39,40                                                SPABF630
   39 IF(ND(27))41,41,40                                                SPABF635
   40 WRITE(6,46)BD(128),BD(10),BD(9)                                   SPABF640
      WRITE(6,43)(BD(I),I=129,132)                                      SPABF645
      WRITE(6,44)(BD(I),I=133,180)                                      SPABF650
   41 WRITE(6,47)                                                       SPABF655
      RETURN                                                            SPABF660
   42 FORMAT(1H13X10HWING LOADS3X8HCOND NO=F7.0,3X3HMN=F6.3,5X4HALT=F7.0SPABF901
     1,5X3HCG=F6.2)                                                     SPABF902
   43 FORMAT(1H03X9HBODY INT=F7.2,8H IN,4X10HSHEAR SOD=F8.0,3HLB,4X10HBENDSPABF905
     1 SOD=F10.0,5HIN-LB,4X10HTORSN SOD=F10.0,5HIN-LB///13X7HSTATION18X5HSPABF906
     2SHEAR16X8HBEND MOM21X9HTORS MOM/14X4H(IN)21X4H(LB)18X7H(IN-LB)22X7SPABF907
     3H(IN-LB)/)                                                        SPABF908
   44 FORMAT(1H F10.2,F24.0,F25.0,F29.0)                                SPABF910
   45 FORMAT(1H13X21HHORIZONTAL TAIL LOADS3X8HCOND NO=F7.0,3X3HMN=F6.3,5XSPABF915
     14HALT=F7.0)                                                       SPABF916
   46 FORMAT(1H13X19HVERTICAL TAIL LOADS3X8HCOND NO=F7.0,3X3HMN=F6.3,5X4HSPABF920
     1HALT=F7.0)                                                        SPABF921
   47 FORMAT(1H1)                                                       SPABF925
      END                                                               [illegible]
```